KEY

TO

EXERCISES IN LOGIC

BY

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Second Edition

NOTE.

THE textbook on which this Key is based is Welton and Monahan: *Intermediate Logic* (University Tutorial Press, 10s. 6d.), third edition.

When the problems set in the *Logic Exercises* are dealt with adequately in this book, the solutions consist simply of the appropriate references. In other cases hints are given sufficient to provide material for an adequate answer. The references throughout are to pages, unless otherwise indicated.

Overleaf will be found references to Dr. Welton's *Groundwork of Logic* (University Tutorial Press, 5s.), which have been added for the convenience of matriculants and others using that book.

REFERENCE TABLE
FOR STUDENTS USING WELTON'S
GROUNDWORK OF LOGIC.

The following table supplements for students who are using Welton's *Groundwork of Logic* the references to *Intermediate Logic* given in this Key.

1, 11–14; **4**, 4–5, 13; **6**, 4–5, 13; **11**, 4–5, 13, 15; **17**, 11–14; **59**, 59–61, 303; **60**, 54, 61–2; **65**, 53, 58, 62–3.

102, 57–8, 61–2; **105**, 55, 57–8; **109**, 54–8; **110**, 189–91; **153**, 55, 57–8, 184; **161**, 178–9; **165**, 168–9, 183–4; **167**, 178–83; **169**, 185 ff.

208, 39–42; **209**, 41, 49–51; **214**, 46–7; **252**, 6–11, 104; **257**, 6–11; **263**, 10–11; **265**, 6–11.

301, 42–3, 48–9; **303**, 42–4, 46; **308**, 45–6; **355**, 76–8.

405, 69–71; **407**, 73–4; **431**, 69–71.

501, 250, 253–4; **503**, 250–1 **507**, 264, 265; **514**, 253; **515**, 268–72; **524**, 257–9; **526**, 252–3; **527**, 268–9; **537**, 268; **540**, 252, 253, 265; **542**, 268–9, 271; **544**, (*a*) 287–8; **545**, 253–4, 265 (iv), 81–2, 228–9.

601, 225–8; **606**, 225–8; **608**, 234–41; **612**, 272; **613**, 272; **614**, 273–5; **620**, 272, 273; **651**, 100–4; **654**, 257–8.

752, 200–1; **759**, 160, 220–5; **760**, 199–203; **767**, 200–3; **768**, 136–40; **770**, 163–4, 220 ff.; **773**, 166–7, 100–4; **778**, 104–5; **781**, 198–9, 200–3.

860, 135–40, 142–5; **867**, 142–5; **875**, 214–17; **879**, 214–217; **882**, 204–6; **884**, 142 ff.; **887**, 163–4; **892**, 201–12; **895**, 164–5, 166–7, 294–5.

1001, 5–6, 294, 297; **1006**, 102–4, 147–8, 293–301; **1009**, 229–300; **1011**, 104–5; **1017**, 293–301; **1057**, 116–25; **1058**, 109–116.

KEY TO LOGIC EXERCISES.

(The references throughout are to pages, except when otherwise indicated.)

CHAPTER I.

STANDPOINT AND SCOPE OF LOGIC.

1. W. & M., 1–5, 8–12.

The statement is made by J. S. Mill, and may be accepted, since it is the function of Logic to find out what are the principles which guide thought if it is to be successful in its search for truth. But the meaning of " Logic does not observe " must be made quite clear. The sole point is that Logic does not observe any *particular* subject-matter with a view to finding out what relations exist within it. It *does* observe what methods are adopted by thought, and what principles these methods illustrate. It may also be fairly said to " discover," not particular facts, but general types.

2. W. & M., 8–12.

3. W. & M., 42, 55–9.

We should propose—

    (*a*) A study of the different kinds and sources of ambiguity. This is partly provided for in the classification of fallacies.

    (*b*) An insistence on the importance of context, or relevance, in determining meaning.

    (*c*) A doctrine of the limits of connotation and of definition.

4. W. & M., 5–8.

(1) The definition is unduly narrow and applies only to Scholastic Logic. There is no antithesis whatever between Consistency and Truth. We can never afford to neglect all material considerations. Thought, in so far as it agrees with objective reality, involves a wider consistency.

(2) The definition, which was suggested by J. S. Mill, may stand if we are sure of what we mean by "estimation of evidence."

(3) The objections to this attempt at definition are:—
Logic is not wholly negative in its aim.
Thought is not mechanical, but ever developing.
To combat fallacy is not the main object of Logic, but to find the principles of valid thought.

5. W. & M., 6, 7.
For Formal Logic, as much as for any other kind of mental discipline, valid thought is true thought. But true thought is always controlled by some aspect of what we call reality. If " existence " is used in so wide a sense as to include *all* that we usually refer to under the name of the Real, then Formal Logic certainly is related to the question of Existence.

6. W. & M., 5-8.

7. The meaning is that Truth is not given to us complete at the outset. We have to search for it; and thus the process is not merely one of unfolding what is there all the time. It is maintained that, if Truth were a datum, Logic would be literally a matter of consistency alone.

8. (*a*) If " more intricate studies " means more ultimate studies, such as Ethics or Metaphysics, Logic may be regarded as a preparation, in that some of the principles which it assumes must be thoroughly criticised, and their relation to reality made clear.

(*b*) If " more intricate " means more specialised, Logic may give help by its study of scientific method. All the special sciences must conform to its regulative principles.

(*c*) In any case the mental discipline of Logic will be of service in other realms of study.

9. W. & M., 5-12.
The answer is in the negative. Even in those parts of Logic which are mainly formal some material considerations are to be found, *e.g.* in the justification of Immediate Inferences, and the Import of Propositions.

10. Logic does not, except indirectly, give us further knowledge concerning any specialised realm of existence. It is simply concerned with the *principles* of valid thought. It takes some of the results that valid thought has achieved, not for the interest of the results themselves, but in order to discover the principles that are involved in familiar processes of seeking truth.

11. W. & M., 6, 7.
The statement indicates that it is impossible to treat Logic in a purely formal way, apart from all reference to the real world.

12. Probably the most fruitful idea is that of " real validity," or validity that does not lose touch with the nature of the reality that is being dealt with.
We might then say: " Logic is the systematic study of the general principles involved in the search for truth."

13. W. & M., 11, 12.
Logic and Ethics are both normative sciences, Logic having Truth as its ideal, and Ethics Goodness; Logic dealing with thought, and Ethics with the whole of life.

14. W. & M., 1-9.

15. (*a*) A *word* is any distinct sound or combination of sounds, spoken or represented, which expresses some meaning.
Name and *term:* W. & M., 19. Every name or term is not a word, since a name or term may consist of a collection of words; nor is every word a name or term, since some words (*e.g.* adverbs) do not by themselves form names or terms.

(*b*) *Sentence* and *proposition:* W. & M., 96. Neither a term nor a proposition can by itself be illogical; a proposition in combination with others *may* be illogical.

16. W. & M., 6, 7.
(*a*) W. & M., 18, 19. Logic is "formal" in the sense that it deals with the general nature of thinking without reference to the particular details of the objects thought about.
A *term* is a name used as subject or predicate of a logical proposition. A *concept* is the idea which the term represents.

The logical treatment of terms may be relatively formal; and the concept again, being the result of discrimination, comparison, selection, and interpretation, may become a kind of form into which we fit every-day events. Names or terms are not properly to be dealt with in complete distinction from concepts.

(*b*) The categories are usually considered to be simply the general ways in which the developed mental life views experience. They are the result of a great deal of abstraction, and may be treated as definitely formal. At the same time they spring from an activity of mind, exercised upon what we call the facts of the real world, and so they cannot be regarded as *merely* forms of pure thought.

17. W. & M., 1–12.

CHAPTER II.

HOW LOGIC DEALS WITH LANGUAGE.

§ 1.

51. W. & M., 11, 12.

Language is concerned with the differences between parts of speech in themselves; Logic studies parts of speech only in relation to their general *meaning* and function. Logical analysis is into Subject and Predicate.

52. Logic appeals to the reason and seeks to convince; Rhetoric appeals to the emotions and seeks to persuade. Logic demands avoidance of ambiguity; Rhetoric may seek ambiguity.

53. Words express meaning; "substitute signs" may be manipulated even when the meaning is not known, as in algebraic symbolism. "A word is an instrument for thinking about the meaning which it expresses: a substitute sign is a means of not thinking about the meaning which it symbolises." (Stout.)

54. The meaning seems to be that what a word signifies depends to some extent on its context. Compare "The *ball* bounced high" with "Are you going to the *ball* to-night?" Words in the course of their history may often change in meaning.

55. Generalisation widens or extends the application of words and so lessens their fixed meaning, and thus allows the same word to have different senses; e.g. *court, to boycott.*

Specialisation narrows or restricts the application of a word, making its meaning more definite; e.g. *fowl, Speaker* (of the House of Commons).

56. See 54 above, and give several similar illustrations.

57. Logic demands definition only when the ambiguity of terms, useful up to a certain point, increases to such an extent as to threaten to obscure meaning. But if we press the desire for extreme clearness too far, we may miss the possibility of expressing fine shades of meaning, and may easily omit important implications of a term.

58. W. & M., 11, 12.

59. W. & M., 32-4.

Idlers (1) might merely mean people who, in the opinion of the speaker, were not *well* employed. It would then be positive. (2) It might simply call attention to a present lack of diligence, in which case it might fairly be called *privative.*

Aliens could be used either *positively* or *negatively.*

60. W. & M., 30.

61. (*a*) W. & M., 22-4.
    (*b*) W. & M., 19, 22-4.
    (*c*) W. & M., 30-2.
    (*d*) W. & M., 30-2, 36.
       W. & M., 19, 34.

62. W. & M., 42-66.

Point out how logical definition is *per genus et differentiam,* and show the possible relation of *proprium* and *accidens* to the logical definition. Discuss also in what way division makes explicit the relationship of *genus* and *species,* and show that the F.D. must be an inseparable accident of the genus.

63. W. & M., 27-30.

64. (*a*) We may re-state as:
The question is " Shall *this* be done ? "
" The question ": *Singular*—" question " is general but the definite article " the " limits its meaning so as to make it applicable to one thing only, hence the term is *significant individual.*

Concrete: an individual existent is referred to.

Connotative: for the implied attributes of a " question " are included here.

" This ": Singular—the reference is to a single act or plan.

If we take a term such as " act " or " plan " to be understood, " this " will be *connotative*, and under the same conditions it will be *concrete*. Some, however, will take " this " to be a proper name, and, as such, indefinable.

(*b*) " Colours ": *General*—the meaning of " colour " is here the various ways in which the eye may be affected, not the attribute of affecting the eye.

Concrete: the term is used of any specific colour.

Connotative: though indeed we cannot say what a colour is, but only that it must imply certain characteristics.

" Wave-lengths ": general, concrete, connotative, as above in the case of " colour."

" Light-waves ": general, concrete, connotative, as above in the case of "colour."

65. W. & M., 18.

 (1) W. & M., 19–24.

 (2) W. & M., 30–2.

66. W. & M., 24–6.

It is necessary to ask whether the term contains as elements terms having a general and permanent signification. It seems fair to maintain that the prefix " the right honourable " provides such elements. The term is Significant Individual.

67. W. & M., 37–41.

68. When a genus or differentia is predicated, the proposition is said to be Analytic or Verbal, as the predicate only states explicitly part of what is implicitly contained in the subject; but when a proprium or accidens is predicated, the proposition is synthetic or real, as the predicate then asserts an additional fact.

69. *Means of Locomotion* may be defined as " any device by which a person or thing, or a group of persons or things, may pass from one place to another."

Aeroplane may be defined with sufficient general exactitude as " a means of locomotion in which controlled transition is effected from one place to another through the air and out of touch with the ground." Thus " means of locomotion " is a *genus*, of which " aeroplane " is a *species*.

Both *virtuous* and *temperate* are adjectives and must be defined in relation to some substantive. " Virtue " applies only to self-conscious beings. We could say—

" A virtuous person is one whose life is shaped by him in accord with the Good."

" A temperate person is one whose life, whether of desires, of thought, or of action, is restrained from excess by the demands of virtue."

Here " virtuous " is seen to be a more fundamental conception than " temperate." If we consider the corresponding substantives we should say that " temperance " is a species of the genus " virtue."

§ 2.

101. W. & M., 24–6.

Every name of course has some meaning or signification, but the point to decide is whether a Proper Name has that particular kind of meaning or signification that is called Connotation.

102. W. & M., 19–24.

(*a*) W. & M., 24–6.

All Proper Names are Singular; thus the term " Smith " is applicable to a number of persons, but not in the same sense, as it does not imply attributes.

(*b*) W. & M., 31.

Abstract Names are usually singular, but in some cases may be general; *e.g.* Justice, in reference to different kinds of justice.

103. W. & M., 36.

(i) W. & M., 38, 44–8.

(ii) W. & M., 38–40.

" Essence " is a vague term, but is probably used here of those qualities without which the thing could not be what it is.

104. W. & M., 23–4.

(*a*) *A few brave men* is used " collectively."

(*b*) *Few* is used " distributively " (= " Some . . . not ").

(c) *Army* is used " collectively."

(d) *Pageants* is probably used " distributively," in the sense of " not one of."

105. W. & M., 25-7.

If connotation is fixed and general, proper names have none; but if it is in all cases determined largely by the purpose for which a term is used, they may fairly be said to possess connotation.

106. " Democracy " is best taken here in its literal meaning of " that form of political organisation in which the ultimate power rests with the people of the State or group."

The term is:—

General: it could be applied to any form of organisation having the above general features.

Connotative: with definition as above.

Positive: for definite characteristics are implied.

Concrete: if some special illustration of democracy is referred to—*e.g.* in " the democracy of England to-day."

Abstract: when the term is used in such statements as " Democracy is a great mistake."

Absolute: for there is no direct reference in the term itself to any other form of government.

" Prime Minister " means "the responsible head of a government," or " the most important officer in a State below the king."

It is characterised as follows:—

General, connotative, concrete, positive, relative (the term " prime " suggests other ministers in relation to whom he is chief). (Add remarks as above.)

" Parliament " means " the deliberative and legislative assembly of a tribe or nation."

And the term is—

General, connotative, concrete, positive, absolute.

107. W. & M., 30-2.

(i) If we hold that an attribute directly qualifying an individual is concrete, " swiftness " here is *concrete.*

(ii) "Swiftness" here is presented in direct relation to an abstract term "flight," and so is itself *abstract*.

"Struggle for existence" is *concrete*, as it is capable of being conceived to exist by itself.

(iii) "Moon" is *concrete*.

"Light," referring to definite undulatory movements in the luminiferous ether, is *concrete*.

"Brightness," being presented in direct relation to the concrete "stars," in itself *concrete*.

108. W. & M., 19–22, 24–6.

109. W. & M., 19–20, 24–6.

This can in no sense be true. If "Popocatapetl" is really meaningless, it is not properly a term at all. The only way in which proper names may consistently be held to be connotative is by maintaining that the connotation of a term always depends upon the sense in which it is used. But that is quite different from maintaining that we must know the original or etymological significance of a term, before we can assign any connotation to it.

110. W. & M., 39–41.

    (*a*) "British subjects" is a *separable accidens*.

    (*b*) "Two angles equal" is a *proprium*.

    (*c*) "Teachers" is a *separable accidens*.

111. W. & M., 28–9.

112. W. & M., 37–41.

113. W. & M., 30–2.

(*a*) There is a sense in which "animal" may be said to be more abstract than "horse." But it is better to use the term "indeterminate." Abstraction is not a mere matter of leaving out qualities.

(*b*) The main reason is that a singular abstract represents an ultimate experience, and so cannot be expressed in any simpler terms.

114. "Museum": general, connotative, concrete, positive, absolute.

" Paternity ": singular, non-connotative, abstract, positive, absolute.

" Deafness ": general, connotative, abstract (or concrete, according to context), privative, absolute.

" Refreshment ": (1) the state or process of being refreshed : singular, non-connotative, abstract (usually), positive, absolute.

(2) That which refreshes: general, connotative, concrete, positive, absolute.

" John Bull ": singular (Proper Name or Significant Individual), non-connotative (or connotative, if Significant Individual), concrete, positive, absolute.

115. (a) " Power " is a *proprium*. (But if " power " is used in the ordinary literal sense, it might here be classed as a *separable accidens*.)

(b) " Scotland " is merely a synonym for Caledonia; the proposition is " verbal."

(c) "Smoke " is a *separable accidens*.

(d) " Mammals " is a *genus* of which " whale " is a *species*.

116. (The most common meanings of the terms only are dealt with.)

Conservative: Genus: person interested in politics.

Differentia: desirous of maintaining established institutions

Property: cautious in his attitude towards new proposals.
Accidens (separable): wealthy.

Box: Genus: enclosed structure.
Differentia: specially made for containing some kind of article.
Property: useful.
Accidens (separable): having a lock and key.

Bounder: Genus: a person.
Differentia: whose claims are far beyond his merits.
Property: lacking in modesty.
Accidens (inseparable): unpleasant to live with.

117. W. & M., 41, 44–8.

Obviously the summum genus is not definable *per genus et differentiam.* Logicians disagree as to whether or not it should be taken to be self-defining.

118. W. & M., 41.

If by *infima species* in any given case is simply meant the species at which interest leads us to stop the division, it *may* be further divisible. In its strict sense the *infima species* is not further divisible.

119. All abstract terms are denotative, and general abstract terms are connotative as well.

120. (*a*) W. & M., 34.

   (*b*) W. & M., 15–17.

§ 3.

151. W. & M., 66–7.

(*a*) The division is poor, for there is more than one F.D., and the members overlap. We might divide into " private " or " public," and then have a further division on the basis of educational standing, or purpose.

(*b*) There is more than one F.D.; the division is not exhaustive, and the members overlap.

On the basis of political party we could divide into Unionist, or Liberal, or Labour, or Socialist, or Independent.

On the basis of fiscal policy the division would be into " Free-Traders," or " Tariff Reformers " (or " Protectionists ").

(*c*) Logically the division is sound. But the F.D. is not very well chosen, and is really irrelevant, except for division by dichotomy.

152. W. & M., 24–7, 42–4.

Meaning may include the whole signification of a term. Proper Names may come to be richer in suggestion than any other terms though they are generally regarded as not possessing that general and fixed signification that constitutes connotation.

153. W. & M., 42-8.

154. W. & M., 72-5.

155. W. & M., 69.

156. (i) There is a change of F.D. In "building land," "farm land," the basis is the use to which the land is put; in "woodland" and "pasture" it is rather the nature of the land itself. To correct, we should have a co-division.

(ii) This is merely physical partition.

157. W. & M., 44-5.
The two main steps are:

(1) Consider the most nearly related terms so as to find the proximate genus.

(2) Compare together these terms so as to find out the differentia.

158. (1) The F.D. is not well chosen. In this case however it is pretty well impossible to get a logical division, though we may have analysis.

(2) This is a kind of physico-psychical partition, and is not logical division at all.

(3) The F.D. is changed. We start on a basis of the arrangement of words in sentences, and continue on that of the quantity of syllables, or use of language in verse.

159. (a) W. & M., 48-52.

(b) (1) This is merely metaphorical description.
Reconstruction: Tact is that skill or adroitness in doing or saying exactly what is required by or is suited to the circumstances.

(2) The fault is redundancy.
Reconstruction: A lake is a sheet of fresh water entirely surrounded by land.

(3) No serious objection can be urged to this definition.

(4) Day cannot be defined except by reference to "sun." There is *circulus in definiendo.*
Reconstruction: The sun is a celestial luminary which warms the planets.

(5) This is metaphorical description.

Reconstruction: Work is purposed activity, not entered upon merely for the sake of pleasure, but meant to sustain and stimulate life.

160. W. & M., 66–9.

    (*a*) W. & M., 69, 70.

    (*b*) W. & M., 67.

161. W. & M., 75–7, 82, 83.

162. We select " lake."

(*a*) A lake is a large sheet of water, lying inland, and not running like a river.

(*b*) A lake is a sheet of fresh water, entirely surrounded by land.

(*c*) The genus, " sheet of fresh water," is given.

The differentia, " entirely surrounded by land," is adequate, and forms an explicit statement of the connotation.

The definition is in no way ambiguous or tautologous, and is affirmative.

163. (*a*) W. & M., 36, 42–4.

Both aim at a clear specification of the meaning of the term. Definition makes use of the predicables *genus* and *differentia*.

(*b*) (1) This is *ignotum per aeque ignotum.* " Light " may fairly be said to indicate an immediate experience. We may say that light involves undulatory motion in the luminiferous ether, but that is no definition, and in fact involves tautology.

(2) If we add the proximate genus, " that form of immediate inference," the definition will stand. Thus: The contrapositive is that form of immediate inference which gives us the converse of the obverse.

(3) This is simply nonsense, and is in no sense a logical definition.

164. W. & M., 77–85.

165. W. & M., 42–8, 67, 68.

(1) There are two F.D.'s here—sex and age.

(2) Broadly this is acceptable, but requires further definition.

(3) This is physical partition.

(4) The F.D. is changed. "Spiritual" has no place in this division.

(5) Anarchy is strictly "no government," and so should be ruled out. The other three members form a division which is not exhaustive.

(6) There is ambiguity in "organism," for in "social organism" the term is used metaphorically only. The division also is not exhaustive.

166. (a) W. & M., 32-4.

Point out that negation always has reference to a certain universe of discourse, and so gains a positive signification.

(b) W. & M., 72-5.

(i) Undoubtedly, dichotomy does demand material knowledge, but it is of value only as a preliminary to a genuine classification and as testing the completeness of a division.

(ii) This statement, though it is expressed much too absolutely, has some basis in fact.

167. Some sciences have to do mainly with large numbers of objects, and classification becomes essential in order that these should be kept in order. In general, the more abstract a science is the more does it use analysis rather than classification in the strict sense. Again, classification is often of extreme value where large numbers of facts are to be handled and few laws are known. But classification can be said to be necessary in every science only in the sense that order is necessary. It may be that the subject-matter has little possibility of being treated according to the methods of logical classification.

168. W. & M., 75-7, 82-5.

169. W. & M., 42-5.

(1) The *differentia* given is insufficient, and the definition is too narrow.

Reconstruction: Excise is an inland tax levied on articles produced and consumed within a country or on licenses to deal in certain commodities.

(2) This may involve *circulus in definiendo*, according to the view we take of the meaning of " wealth."

(3) " Frozen music " is an ambiguous metaphor. The definition is obscure.

(4) " Method of avoiding litigation " is not a proximate *genus*. " Litigation " is a less familiar term than " arbitration." The *differentia* given is inadequate, for there is such a thing as compulsory arbitration.

(*a*) A dictionary is a book purporting to contain in alphabetical order all the recognised words of a language, together with their meanings.

(*b*) (i) A ball is any portion of matter having a round shape.

(ii) A ball is a form of entertainment consisting in dancing.

(*c*) A telephone is an electrical apparatus whereby two persons may speak one to another over a long distance.

170. W. & M., 82–5.

171. (1) This definition is merely metaphorical.

(2) " Deliberative " is a term less familiar than " council." The *differentia* is inadequate.

(3) " House-building " is an *accidens*, and not a *differentia*; the definition is too narrow.

172. W. & M., 66–70.

Ship: Taking " means of navigation " as F.D., we have (*a*) sailing ship, (*b*) steamship, (*c*) electrically-driven ship, (*d*) petrol-driven ship. But the species might overlap.

Or we may divide into (*a*) coasting vessels, (*b*) deep sea vessels, and then have subdivision.

Or we may take (*a*) belonging to a navy, (*b*) privately owned, and this also requires subdivision.

Lawyer may be divided with sufficient accuracy on the basis of the kind of work done into (*a*) barrister, (*b*) solicitor.

Virtue: It is practically impossible to avoid overlapping. We might divide into (*a*) personal, (*b*) social, (*c*) religious. But (*c*) would involve elements of both (*a*) and (*b*). Then there would be subdivision, enumerating the various virtues.

College: We could have a first division into (*a*) private, (*b*) state-aided, but privately controlled, (*c*) publicly controlled.

Continued division would best be performed on the F.D. of the status of the institution.

173. (a) This fails to give what is usually taken as the *differentia* of "phoenix." Say: "fabled to rise again from its own ashes."

(b) This is merely metaphorical.

(c) The *differentia* is inadequate and the definition too wide (e.g. it would apply to whales). The correct mark is "breathing by means of gills."

(d) The *differentia* is ambiguous and inadequate and the definition too wide. If the object is to define "gentleman" in the popular sense from the point of view of his income, it would be better to say "is a man who can obtain the recognised comforts of life without himself engaging in money-making occupations."

174. W. & M., 79, 243.

175. The values are increased definiteness; the dangers apparent withdrawal from actual life.

W. & M., 31, 32.

176. W. & M., 42–5.

177. W. & M., 42–4.

In what is called "Definition by Type," an individual member of the class is described as representing the class.

178. W. & M., 45–8.

179. W. & M., 80–5.

180. (a) W. & M., 44, 45.
(b) W. & M., 45.

181. W. & M., 48.

182. W. & M., 42, 44.

Definition is dependent upon Division in the sense that the range of reference of a term and the significance of that term may influence one another.

183. W. & M., 42–4, 45–7.

184. W. & M., 66, 67, 69–72, 75, 79.

185. W. & M., 75–7, 223.

K. L. E.

CHAPTER III.

THE PROPOSITION.

§ 1.

201. (See No. 68)—

      (*a*) gives a " verbal " proposition,

      (*b*) gives a " real " proposition.

202. " Illogical " applied to propositions really means self-contradictory. " Extra-logical " means outside any considerations that are relevant to Logic.

203. (See No. 68.) The distinction between analytic and synthetic corresponds to that between verbal and real.

204. W. & M., 18, 89–90, 110.

The quotation is erroneous. There is no such thing as " simple " apprehension. Judgment is the essential form of thought, and we " apprehend " or " conceive " only by making judgments about a thing. The judgment is not a definite comparison between two clearly recognised things or factors: it is a unity.

205. Jevons said that essentially the relationship expressed in a Logical proposition was that of identity. By identity he understood mere formal sameness, and so he agreed to the use of the mathematical sign $=$. Thus he reduces propositions to the form $A = B$. But clearer specification of the predicate makes this into $A = AB$, and eventually we come to the form $AB = AB$, and the whole system is reduced to the assertion of a tautology.

206. (See No. 68.)

207. W. & M., 90, 103.

Some give the order as Categorical, Hypothetical, Disjunctive; others as Categorical, Disjunctive, Hypothetical. Within these many other types—*e.g.* impersonal, demonstrative, etc.—are recognised.

208. W. & M., 18, 89, 90–6, 99, 101–2.

A judgment is a single assertion or statement of fact, and the expression of it in language is a proposition.

209. The general question involved is that of the relation of Judgment to Reality. We have, however, to distinguish between Truth and Existence. The judgment refers to some sphere or "world" and assumes its reality.

210. Meaning can hardly be defined. We can only say that it is the way in which any portion or constituent of experience is apprehended. Thus the ultimate facts are the subject, an object, and some relation between the two.

211. The Unit of Thought is Judgment. But a Logical proposition is a judgment expressed in the form of a subject-predicate relationship, or at least it is capable of being so expressed.

212. An affirmative proposition may be regarded as the assertion of an identity-in-difference, and it may be held that negation can be understood only in the light of the laws of Contradiction and Excluded Middle. Immediate Inferences involve appeal to the principles of Identity, Contradiction, and Excluded Middle.

213. The meaning is that any attempt to express the nature of our relation to objects of our experience must involve judgment.

214. W. & M., 95–6.

(a) The relation is one of mutual implication. Sometimes contradiction is used widely to include contrariety.

(b) Negation is always within a system, and so has some positive significance. The relation here is that the two usually make up the total system in which they are related as alternative possibilities.

(c) This is the relation of obversion. See W. & M., 126–9. "Not-P is a purely formal conception, summing up and containing under it any possible contrary. We never make the bare idea of the contradictory the predicate of a judgment."—*Mellone.*

215. A concept might be said to be a sort of unextended judgment. It certainly does involve thought and much discrimination, but it is not drawn out and expressed fully. Judgment is better regarded as a development of a single concept than as a relation of two. The impersonal judgment is of the form " It rains." Here a vague mass of present experience is analysed to some extent, and one of its constituents is emphasised.

§ 2.

251. W. & M., 13, 14.
There is no contradiction. The two are sub-contraries and both may be true. But one is not true *because* the other is.

252. W. & M., 13, 14.
(*a*) Laws of nature are fully-established statements of universal and necessary connexion.

(*b*) Laws of rhetoric are prescribed rules which should be followed if success is to be gained.

Laws of thought are not prescribed from without; they are inherent in the very conditions of thought itself. They must be observed in the study of all other laws.

253. W. & M., Ch. II. The laws are negative in that in themselves they give no knowledge, but they *regulate* given matter in a general way.

254. W. & M., 15–17, 115-19.

255. W. & M., 13–17.
Each of the three principles is usually treated as independent and self-evident.

256. W. & M., 14.

257. W. & M., 14, 17.
Point out how the two laws taken together may show the positive significance of a negative statement.

258. W. & M., 14.
The statement may be accepted. Science seeks order over a wide field, but recognises differentiation within that field.

259. W. & M., 16-17.

It is not the *truth* of a proposition that has relation to time, but only the point of view from which we make it.

260. W. & M., 14.

It might be so regarded, if we lay emphasis upon the fact that what we get is identity amid diversity.

261. There are three possible positions:—

(*a*) *Unconscious* violation is possible.

(*b*) What we call "violation" is really mere failure to think at all.

(*c*) Fallacy is due to the complexity of the matter of argument, and not to an infraction of formal conditions.

In some cases (*b*) holds, and in other cases (*c*) holds.

262. W. & M., 13, 14, 15–17.

263. W. & M., 17.

Two laws of thought are included under this principle: (1) Every judgment must be capable of being shown to be the conclusion from certain premises; (2) Every event has a cause.

264. (1) Although it may be said that negation is mainly tentative, is not final, and is often due to a restricted point of view—all controversial matters—yet it does not follow that the negative judgment is subjective. Thus while we may fairly hold that there is no final satisfaction in making statement (*a*)—for we must know what the soul *is*—yet it could be held that this does express a fact of reality.

(2) Negation does involve denial of relation, but it also involves more than this. Thus in (*b*) relation is denied between the soul and a ship in full sail, but it remains that the soul *is* something else (unspecified). Very often the special context of a negative judgment will give it a quite definite significance.

265. W. & M., 13-17.

By themselves of course the laws are purely general: what does not conform to them cannot be true. But they are of

positive value even in this, for they are the general conditions of our avoiding self-contradiction.

266. See 256 above.

§ 3.

301. W. & M., 90, 100–4.

302. (See No. 68, end.) Exclusive Propositions contain a word such as "alone," limiting the subject. Exceptive Propositions exclude *part* of the denotation of the subject by some such word as "except."

Verbal: (i), (ii), (iii), (vii).

Real: (iv), (v), (iii).

(iii) might be verbal or real according to the meaning of the repeated "right."

Of (vi): the predicate "are dependent on the habits and means of the traveller" is real; but the predicate "on the rate of charges, etc.," is verbal.

303. W. & M., 90–3, 108, 109.

    (*a*) W. & M., 92, 93.

    (*b*) W. & M., 93–5.

304. W. & M., 64, 95, 96, 102–4.

305. W. & M., 91, 101, 102.

306. W. & M., 97–9 (see No. 68).

307. W. & M., 97–99, 101-102.

308. W. & M., 90–5, 103.

It is not possible satisfactorily to reduce all forms of judgment to the categorical type.

309. W. & M., 101, 102.

310. The quantification of the predicate is a development of the class form of proposition. If both the terms of a proposition are read in denotation, the relation between them is reduced to an equation; and it would seem to follow, on this view, that it is necessary to quantify the predicate. The predicate being thus quantified in thought, it was held that this

quantification should be expressed. From the four forms of proposition, eight were obtained. This scheme was said to simplify logical processes; but the doctrine is psychologically false, and is worthless as an analysis of judgments. Quantifying the predicate does not give an identical proposition. Hence simple conversion, on this scheme, involves an implicit specification of our terms.

If "some" means *some only*, the eight-fold scheme is redundant. Thus we get a five-fold scheme, which expresses all the possible quantitative relations between two classes. If "some" means *some at least*, we are expressing, not the actual relation between the classes, but our knowledge of those relations. We are again reduced to a five-fold scheme. None of the new forms are admissable in an analysis of simple propositional forms.

311. Mill held that every proposition which is not singular expresses a relation between attributes. He is right in holding the ultimate import of judgment to be relation of content, but wrong in deriving this from enumeration of instances.

Different interpretations may be suitable in different cases. Propositions cannot be read in intension only, or in extension only.

The statement does not amount to very much. It is, however, true that science aims at finding the ground of relation rather than the mere fact of relation.

312. W. & M., 100–2, 116.

313. W. & M., 95, 96

314. W. & M., 18, 100.

315. It is true that the copula relates rather than divides, but there may be a relation of sundering. In fact a "negated copula" is a denial of assertion, but denial is itself a form of assertion. It is better to keep the phrase "negative copula," and understand by it an assertion of a relation of sundering, although at the same time "mere" sundering is never possible.

316. W. & M., 90–5, 103.

317. W. & M., 93–5.

318. W. & M., 90–3.

The reduction cannot be effected without real change of emphasis and significance.

§ 4.

351. (*a*) A smattering of knowledge | is | dangerous   A.

    (*b*) A cowl | is not | able to make a monk   E.

    (*c*) (i) Some of the men | are | persons who rode back   I.

        (ii) Some of the six hundred | are not | among those who rode back   O.

    (*d*) Some men | are not | really happy   O.

    (*e*) All non-philosophers | are | able to see this   A.
        A possible alternative form is: Some philosophers | are not | able to see this   O.

    (*f*) All men here | are | able to tell you the way   A.

    (*g*) The proportion of those who were wrong | is | a very large one   A.

    (*h*) The number of persons who were right | is | the total number diminished by six   A.

    (*i*) All men | are | apt to lose their temper at times   A.

    (*j*) Some who applaud | are not | genuine   O.

352. W. & M., 23, 24, 64, 65, 103, 104.

353. The usual reason is a desire to avoid ambiguity. If there is no danger of ambiguity, some freedom of expression is allowable.

354. (*a*) All old people | are | more experienced than young people   A.

    (*b*) Some men | are not | able to decide what they ought to do   O.

    (*c*) { None other than children | are | admitted   E.
        { All those admitted | are | children   A.

    (*d*) Some answers | are not | good enough   O.

355. W. & M., 90–100.

356. (*a*) Some thoughts that came to him | are | thoughts that brought him comfort   I.

(*b*) All the books chosen by you | are | sold   A.

(*c*) One of his uncles | is | a man who was dead   A.

(*d*) China | was | the scene of a great plague   A.

or The great plague | is | something that broke out in China   A.

(*e*) (i) This book | is | a splendid specimen of his work   A.

(ii) This book | is | one that will be of value in a few years   A.

(iii) This book | is | one that was little noticed on its publication   A.

357. W. & M., 95.

(*a*) All angles inscribable in a semi-circle | are | right angles   A.
(For the predicate is a *proprium*.)

(*b*) All monkeys are mischievous   A.
(For the predicate is an inseparable *accidens*.)

(*c*) Some stone walls | are not | things able to make a prison   O.
(For the predicate is a separable *accidens*.)

(*d*) All logicians | are | argumentative   A.
(For the predicate is a *proprium*.)

358. (See No. 302.)

359. An Exponible Proposition is a compound proposition whose composition is not obvious from its form.

360. (1) No non-logicians | are | able to see any difficulty here   E.

or All able to see any difficulty here | are | logicians A.

(2) Some who try | are not | successful   O.

(3) Nothing he did | is | able to recall those unfortunate words   E.

(4) (i) All bullets | are | bound to go somewhere   A.

(ii) Some bullets | are not | fatal   O.

(5) I | am | a person who will compare thee to a summer's day   A.

(6) That | is | what I said   A.

(7) The number of my answers that were right | is | the total number diminished by one   A.

(8) My cousin | is | a great cricketer   A.

(9) The majority of men | are | persons who have suffered disappointment   A.

(10) All who do not try to succeed | are | failures   A.

(11) That you beware the dog | is | imperative   A.

(12) He | is | a person who is invariably kind except in moments of passion   A.

(13) Some boys | are not | studious   O.

(14) All those who become famous | are | few in number   A.

(15) The proportion of people who failed | is | a very large one   A.

(16) If I were daring, I would do that (Hypothetical proposition)

(17) Some things | are | different from what they were   I.

(18) We | are not | willing to submit to this tyranny   E.

(19) The system of examinations | is not | a fair test of knowledge   E.

CHAPTER IV.

IMMEDIATE INFERENCES.

401. $S \equiv$ metals, $S' \equiv$ non-metals; $P \equiv$ elements, $P' \equiv$ non-elements. Given $S\ a\ P$ the educts are:—

$$S\ a\ P$$

$$
\begin{array}{ll}
P\ i\ S & S\ e\ P' \\
| & | \\
P\ o\ S' & P'\ e\ S \\
 & | \\
 & P'\ a\ S' \\
 & | \\
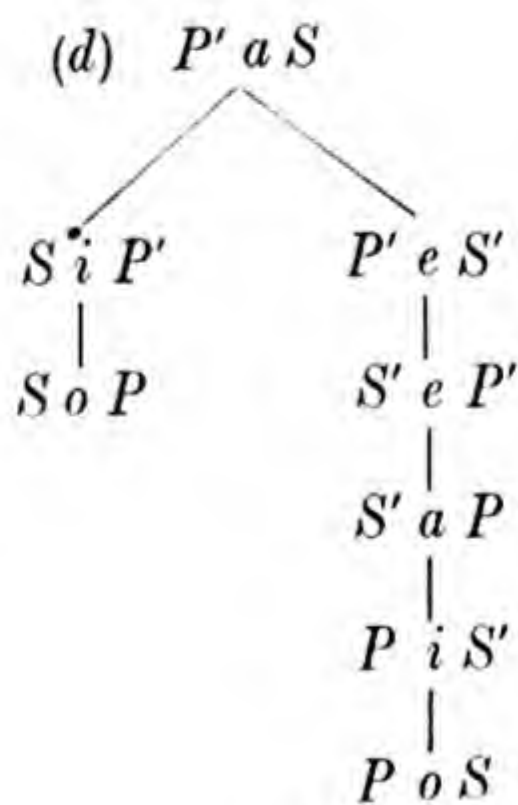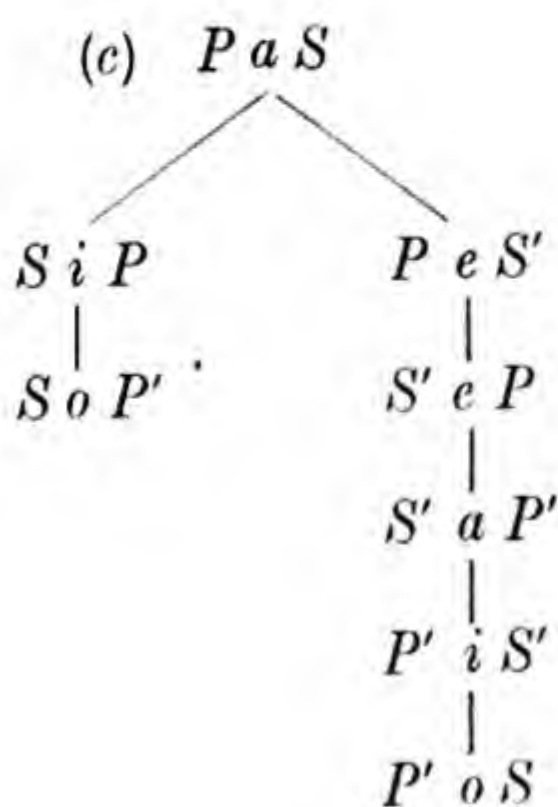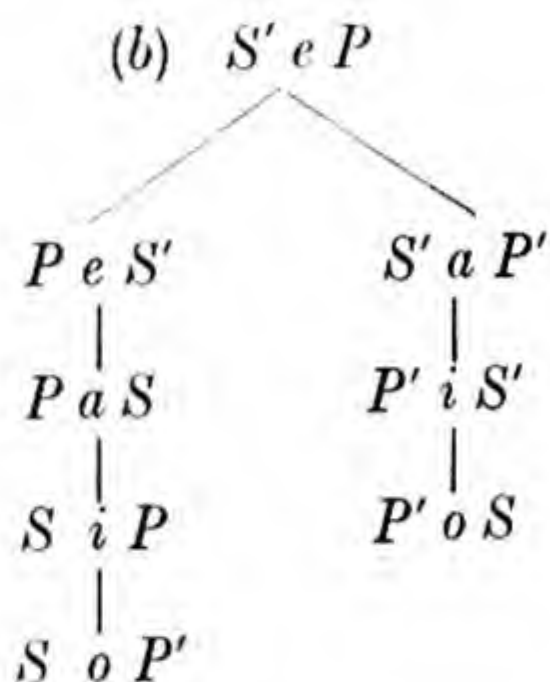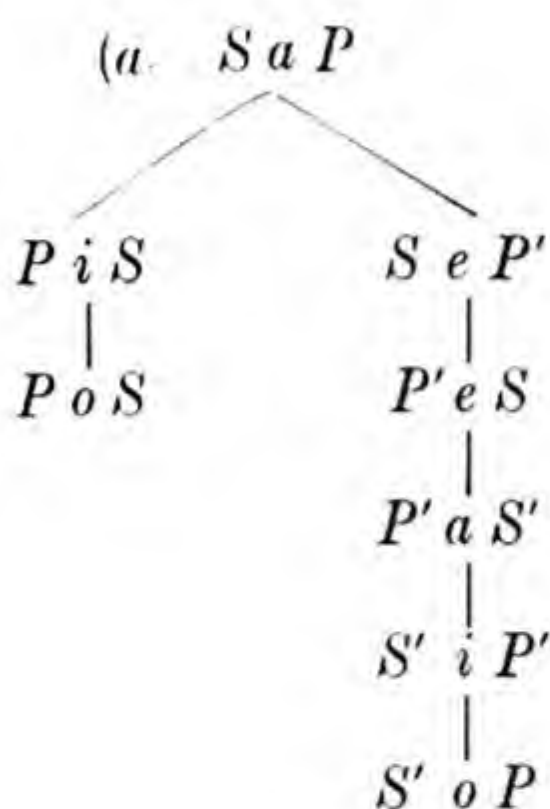 & S'\ i\ P' \\
 & | \\
 & S'\ o\ P
\end{array}
$$

We have: (a) $P\ a\ S^\bullet \equiv$ subalternans of converse of given.

(b) $P'\underline{e\ S} \equiv$ contrapositive of given.

(c) $P\ e\ S \equiv$ contradictory of converse of given.

(d) An inference by Added Determinants from the given.

402. $S =$ loved by gods; $S' =$ not loved by gods.

$P =$ dying young; $P' =$ not dying young.

Given are:—

$$
\left.
\begin{array}{l}
(a)\ S\ a\ P \\
(b)\ S'\ e\ P \\
(c)\ P\ a\ S \\
(d)\ P'a\ S
\end{array}
\right\}
$$
The propositions are all indesignate as they are given, but they are all taken as universals.

27

The educts are:

(a) $S\,a\,P$

$P\,i\,S$ $S\,e\,P'$

$P\,o\,S$ $P'\,e\,S$

             $P'\,a\,S'$

             $S'\,i\,P'$

             $S'\,o\,P$

(b) $S'\,e\,P$

$P\,e\,S'$ $S'\,a\,P'$

$P\,a\,S$ $P'\,i\,S'$

$S\,i\,P$ $P'\,o\,S$

$S\,o\,P'$

(c) $P\,a\,S$

$S\,i\,P$ $P\,e\,S'$

$S\,o\,P'$ $S'\,e\,P$

             $S'\,a\,P'$

             $P'\,i\,S'$

             $P'\,o\,S$

(d) $P'\,a\,S$

$S\,i\,P'$ $P'\,e\,S'$

$S\,o\,P$ $S'\,e\,P'$

             $S'\,a\,P$

             $P\,i\,S'$

             $P\,o\,S$

	(a)	(b)	(c)	(d)
Of (a)	—	is subalternans of inverse.	is subalternans of converse.	is contrary of contrapositive.
„ (b)	is subalternans of inverse.	—	is the obverted converse.	is the contradictory of the obverted contrapositive
„ (c)	is subalternans of converse.	is contrapositive.	—	is contradictory of inverse.
„ (d)	is subalternans of obverted converse.	is contrary of obverted contrapositive.	is subalternans of inverse.	—

403. In each case the predicate is represented by P and the subject by S, with P' and S' for the contradictories. Given—

(i) (a) $S a P$; (b) $P e S$.

(ii) (a) $S' e P$; (b) $S a P$.

(iii) (a) $S a P$; (b) $S i P$ (in this case " do not live to old age " is taken as equivalent to " die young ").

(i) (a) and (b) are inconsistent, but both may be false, for (b) is the converted contrary of (a).

(ii) (a) and (b) are consistent, but not inferrible one from another, for (b) is the subalternans of the inverse of (a) and (a) is the subalternans of the inverse of (b).

(iii) (a) and (b) are consistent; (b) can be inferred from (a), for it is (a)'s subalternans, but (a) cannot be inferred from (b).

404. Taking the usual symbolism we have given:—

$$S \, o \, P$$

$$S \, i \, P'$$
$$|$$
$$P' \, i \, S$$
$$|$$
$$P' \, o \, S'$$

Then "Some non-graduates are teachers" is the contra-positive.

But "Some graduates are not teachers" would be the simple converse, and we should have "teachers" not distributed in the given proposition, but distributed in the "inferred" proposition.

405. W. & M., 105–19.

(a) No good tree is able to produce good fruit.
Contradictory: Some good trees are able to produce good fruit.

(b) (i) No non-clean people shall pass over it.
Contradictory: Some non-clean people shall pass over it.
    or (ii) All who shall pass over it are clean.
Contradictory: Some who shall pass over it are not clean.

(c) Some people do not find it.
Contradictory: All people find it.

(d) All my words shall stand fast.
Contradictory: Some of my words shall not stand fast.

406. (a) Given "All men are sincere" is false, then:

     (i) by contradiction: Some men are not sincere, is true;

     (ii) by contrariety: No men are sincere, is doubtful;

     (iii) by subalternation: Some men are sincere, is doubtful.

(b) "If students love their work they succeed" may be reduced to the form:

(i) All students who love their work succeed $\equiv$ $S\,a\,P$.

(ii) No students who do not succeed love their work $\equiv$ $P'\,e\,S$.

$\therefore$ (i) is the obverted converse of (ii) and (ii) is the contrapositive of (i).

407. (a) W. & M., 120-1.

(b) (i) Logical form: No non-sincere | are | good reasoners.

Contradictory: Some non-sincere | are not | good reasoners.

Converted obverse: Some who are other than good reasoners | are | non-sincere.

(An alternative logical form of the given is

All good reasoners are sincere.)

(ii) Given: Some sincere reasoners | are not | convincing.

Contradictory: All sincere reasoners | are | convincing.

Converted obverse: Some non-convincing people | are | sincere reasoners.

408. (a) Logical form: The village smithy | is | situated under a spreading chestnut tree.

(sub)Contradictory: The village smithy | is not | situated . . . tree.

Contrapositive: Nothing not situated under a spreading chestnut tree | is | the village smithy.

(b) Logical form: Some ignorant people | are | gainers.

Contradictory: No ignorant people | are | gainers.

Contrapositive: There is none, for the given is an I proposition.

(c) Logical form: Some expedient things | are not | just.

Contradictory: All expedient things | are | just.

Contrapositive: Some non-just things | are | expedient.

(d) Logical form: All pupils belonging to some classes | are | clever.

Contradictory: Some pupils belonging to some (i.e. these same) classes | are not | clever.

Contrapositive: No non-clever pupils | are | pupils belonging to some classes.

(*e*) Logical form: None of the perfumes of Arabia | are | able to sweeten this little hand.

(Note that " all " in the given is used collectively.)

Contradictory: Some of the perfumes of Arabia | are | able to sweeten this little hand.

Contrapositive: Some things unable to sweeten this little hand | are | perfumes of Arabia.

(*f*) Logical form: All non-graduates | are | absent.

Contradictory: Some non-graduates | are not | absent.

Contrapositive: None who are not absent | are | non-graduates.

(*g*) Logical form: Some people who do not work hard | are | people who rise to positions of eminence.

Contradictory: No people who do not work hard | are | people . . . eminence.

Contrapositive: There is none, for the given is an I proposition.

409. $S \equiv$ good thinkers; $P \equiv$ good speakers.

$S' \equiv$ non-good thinkers; $P' \equiv$ non-good speakers.

Given $\qquad\qquad S \, o \, P$, and educts:

$$S \, i \, P'$$

$$P' \, i \, S$$

$$P' \, o \, S'$$

We have: (*a*) $P' \, i \, S$.

(*b*) $P \, o \, S$.

(*c*) $S \, i \, P$.

Then if (1) " Some good thinkers are not good speakers " is true:

(*a*) is true, for it is the contrapositive of this;

(*b*) is altogether doubtful. (The forms (1) and (*b*) are called " independent.")

(*c*) is doubtful, for it is the sub-contrary of (1).

410. W. & M., 65, 103, 104.

If "some" means "some only," then I involves O, and O, I. For: Given Some only of S is P, it follows that All S is P is false, and hence, by contradiction, that Some S is not P is true. Or: Given Some only of S is not P is false, it would follow that either A or E must be true, and in either case, with this interpretation of "some," I is false.

Given: Some (only of) men are dishonest.

This means (1) Some men are dishonest and

(2) Some men are not dishonest,

and the contradictory form would be

Either No men are dishonest *or* All men are dishonest.

411. (*a*) No non-wise | are | always right in action   E.

Contradictory: Some non-wise | are | always right in action.

Obverse: All non-wise | are | other than always . . . action.

Converse: None always right in action | are | non-wise.

(An alternative logical form of (*a*) is All who always do right are wise   A.)

   (*b*) Some things having no market value | are |
        desirable   I.

Contradictory: No things having no market value | are | desirable.

Obverse: Some things having no market value | are | not other than desirable.

Converse: Some desirable things | are | things having no market value.

   (*c*) Some well-meaning people | are not | wise in action O.

Contradictory: All well-meaning people | are | wise in action.

Obverse: Some well-meaning people | are | other than wise in action.

Converse: None.

   (*d*) All men and women | are | people who have once been children   A.

Contradictory: Some men and women | are not | people . . . children.

Obverse: No men and women | are | other than people
. . . children.

Converse: Some people who have once been children | are |
men and women.

   (e) All non-initiated | are | among those who with-
      drew   A.

Contradictory: Some non-initiated | are not | among those
who withdrew.

Obverse: No non-initiated | are | not among those who
withdrew.

Converse: Some of the party who withdrew | are | non-
initiated.

   (f) Some mayors | are not | knighted   O.

Contradictory: All mayors | are | knighted.

Obverse: Some mayors | are | other than knighted.

Converse: None.

   (g) No non-combatants | are | allowed within the firing
      line   E.

Obverse: All non-combatants | are | not among those who
are allowed within the firing line.

Converse: None allowed within the firing line | are | non-
combatants.

   (h) Both A and B | are | wrong, may be expressed by—

               (i) A is wrong   (singular) A.

              (ii) B is wrong   (,,) A.

(Secondary) Contradictories: A (B) | is not | wrong.

Obverse: A (B) | is not | other than wrong.

Converse: Something that is wrong | is | A (B).

   (i) Some mistaken people | are not | people who know
      of their mistake   O.

Contradictory: All mistaken people | are | people . . . mis-
take.

Obverse: Some mistaken people | are | other than people
. . . mistake.

Converse: None.

412. (*a*) (1) Logical form: No non-smokers | are | people who are not refused admission.

Contradictory: Some non-smokers | are | people . . . admission.

Converted obverse: Some who are other than people that are not refused admission | are | non-smokers.

(2) Logical form: Some smokers | are not | the most considerate of mortals.

Contradictory: All smokers | are | the most considerate of mortals.

Converted obverse: Some who are other than the most considerate of mortals | are | smokers.

(*b*) Given as false:

Some joys are everlasting

Then:　　Some non-joys are non-everlasting

is a pseudo-inverse, and is not legitimately asserted, for it is an independent proposition.

And:　　All everlasting things are not-joys

is also illegitimate, for it is the contradictory of the obverted converse.　But if we take

Some everlasting things are non-joys,

that also we cannot assert, for it is the sub-contrary of the obverted converse.

413. (*a*) W. & M., 111.

(*b*) The proposition is

(i) doubtful.

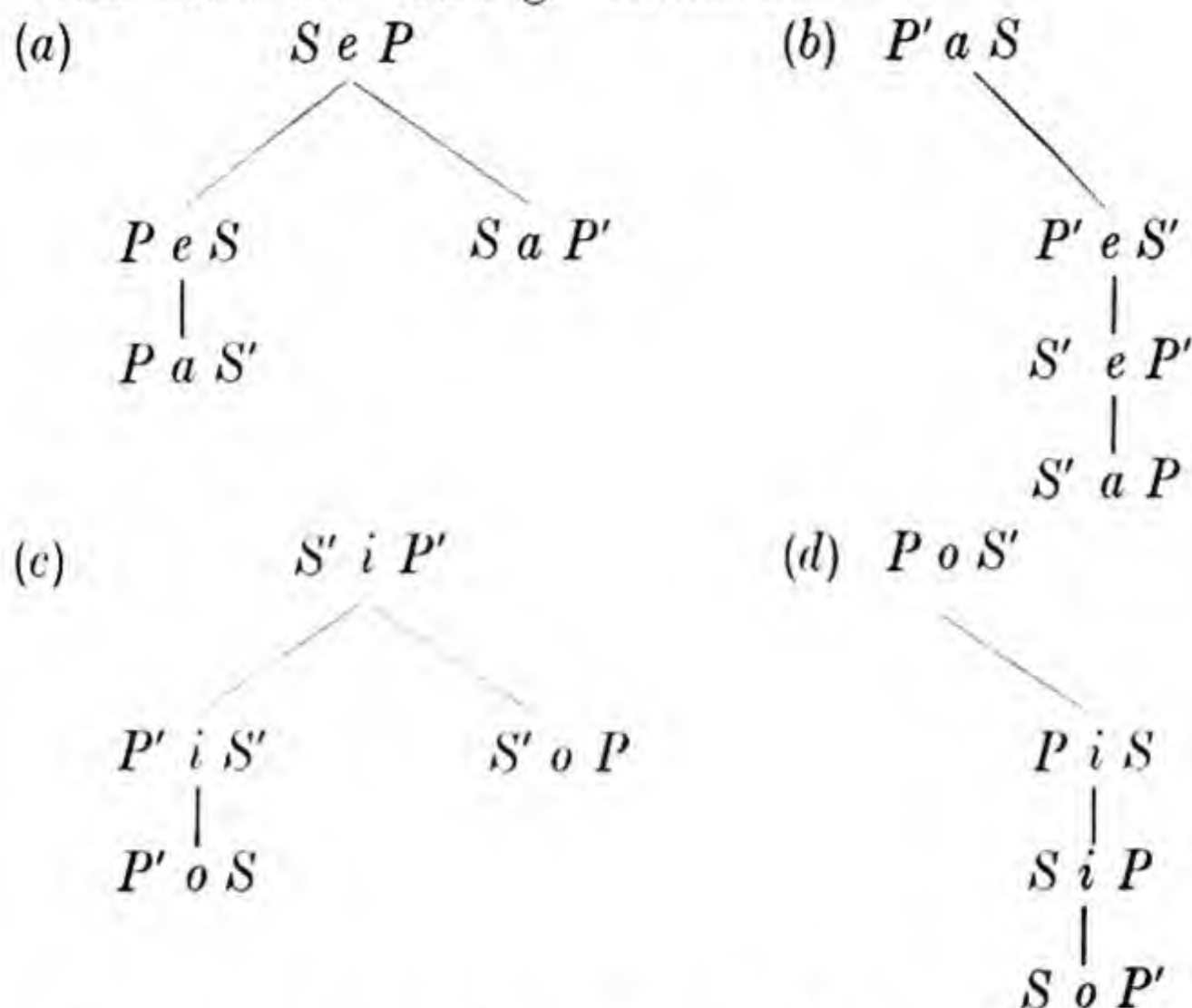(ii) true.

(iii) doubtful.

(iv) false.

(v) false.

Give concrete examples in each case, and under (iv) consider both simple converse and converse *per accidens*.

414. $S \equiv$ intelligent persons; $P \equiv$ prejudiced persons.

$S' \equiv$ unintelligent 　,,　; $P \equiv$ unprejudiced ,,

Given are (*a*) $S \, e \, P$, (*b*) $P' \, a \, S$, (*c*) $S' \, i \, P'$, (*d*) $P \, o \, S'$.

From these the " strong " educts are—

(a) $S\ e\ P$

$P\ e\ S$
$P\ a\ S'$

$S\ a\ P'$

(b) $P'\ a\ S$

$P'\ e\ S'$
$S'\ e\ P'$
$S'\ a\ P$

(c) $S'\ i\ P'$

$P'\ i\ S'$
$P'\ o\ S$

$S'\ o\ P$

(d) $P\ o\ S'$

$P\ i\ S$
$S\ i\ P$
$S\ o\ P'$

" Strong " educts only can be used because any change of quality would make a proposition more indeterminate, and so upset results. We require subjects and predicates to be the same, and so select (a) $S\ a\ P'$, (b) $P'\ a\ S$, (c) $P'\ o\ S$, (d) $S\ o\ P'$.

These are arranged thus—

$$1 \begin{cases} (a)\ S\ a\ P' \\ (d)\ S\ o\ P' \end{cases} \qquad 2 \begin{cases} (b)\ P'\ a\ S \\ (c)\ P'\ o\ S. \end{cases}$$

There is no inference from one group to the other while (a) and (d), (b) and (c) are clearly contradictories. Thus the full results are—

Given	(a) is	(b) is	(c) is	(d) is
(a) true	true	doubtful	doubtful	false
(b) true	doubtful	true	false	doubtful
(c) true	doubtful	false	true	doubtful
(d) true	false	doubtful	doubtful	true
(a) false	false	doubtful	doubtful	true
(b) false	doubtful	false	true	doubtful
(c) false	doubtful	true	false	doubtful
(d) false	true	doubtful	doubtful	false

415. (*a*) All my words | are | words that shall stand.

Converse: Some things that shall stand | are | my words.

Given (*a*) true, then:

" Some of my words | are | words . . . stand " is true by subalternation.

" Some of my words | are not | words . . . stand " is false by contradiction.

" None of my words | are | words . . . stand " is false by contrariety.

    (*b*) Some present | are not | equal to the occasion.

Converse: None.

Given (*b*) true, then:

" Some present | are | equal . . . occasion " is doubtful by sub-contrariety.

" None present | are | equal . . . occasion " is doubtful by subalternation.

" All present | are | equal . . . occasion " is false by contradiction.

    (*c*) All actions which take advantage of the poor | are | mean.

Converse: Some mean things | are | actions . . . poor.

Given (*c*) true, then:

" Some actions . . . poor | are | mean " is true by subalternation.

" Some actions . . . poor | are not | mean " is false by contradiction.

" No actions . . . poor | are | mean " is false by contrariety.

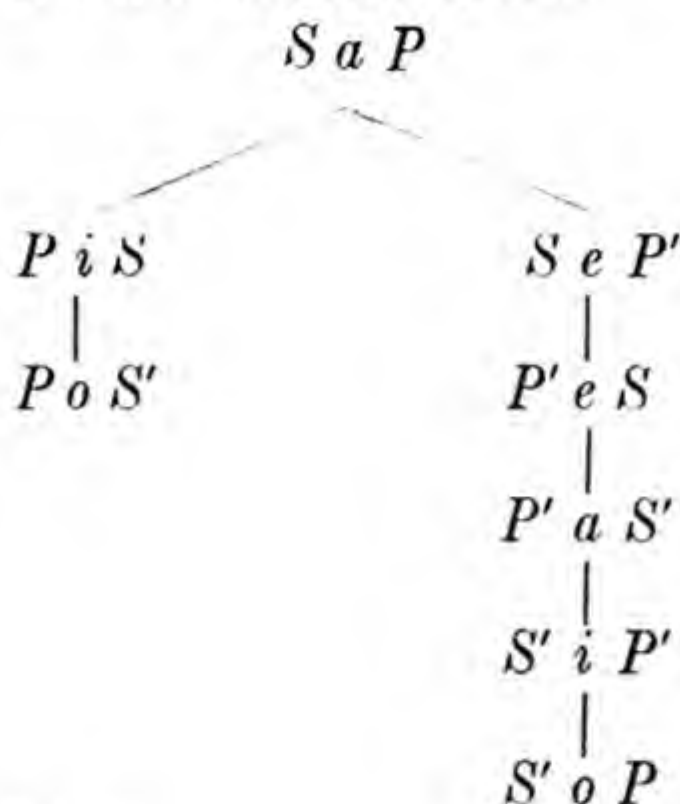   (*d*) Some of his assertions | are not | wise.

Converse: None.

Given (*d*) true, then:

" Some . . . assertions | are | wise " is doubtful by subcontrariety.

" All . . . assertions | are | wise " is false by contradiction.

" No . . . assertions | are | wise " is doubtful by subalternation.

416. (a) Given $S\ a\ P$ the educts are:

$$S\ a\ P$$

$$
\begin{array}{ll}
P\ i\ S & S\ e\ P' \\
| & | \\
P\ o\ S' & P'\ e\ S \\
& | \\
& P'\ a\ S' \\
& | \\
& S'\ i\ P' \\
& | \\
& S'\ o\ P
\end{array}
$$

Thus we can infer:

Some not-S | is not | P and (Inverse.
Some not-S | is | non-P (Obverted inverse.
No non-P | is | S and (Contrapositive.
All non-P | is | non-S (Obverted contrapositive.

(The truth of the inverse of $S\ a\ P$ is conditional on the existence of S' and P'.)

(b) Given: No organic bodies | are | devoid of carbon.
Inverse: Some non-organic bodies | are | devoid of carbon.
Obverted inverse: Some non-organic bodies | are not | non-devoid of carbon.
Contrapositive: Some things not devoid of carbon | are | organic.
Obverted contrapositive: Some things not devoid of carbon | are not | non-organic.

417. W. & M., 115–17.

418. W. & M., 122, 123.

419. (a) W. & M., 117–19.

    (b) W. & M., 119, 120.

    (c) W. & M., 114, 115.

420. (i) If it is merely asserted that "The Cretans usually speak falsely," the conclusions drawn obviously do not follow.

IMMEDIATE INFERENCES.

(ii) Or suppose it is false that all Cretans are liars, then to pass to " All Cretans tell the truth," is a case of confusing the contradictory with the contrary.

(iii) Or if it is true that Cretans never tell the truth, then we simply start with self-contradictory premises, and the course of argument serves to bring out the contradiction.

421. W. & M., 111, 129–34, 126–29.

422. W. & M., 129–34, 127.

423. (a) Nature | is | apparently careful of the type.
Obverted converse: Something that appears to be careful of the type | is not | other than Nature.
Contrapositive: Nothing not-apparently careful of the type | is | Nature.

(b) Some men | are not | musical by nature.
Obverted converse: None.
Contrapositive: Some beings non-musical by nature | are | men.

(c) The direct implication is: No persons who paid heed to the warning | are | persons who came to grief.
Obverted converse: All persons who came to grief | are | persons who did not pay heed to the warning.
Contrapositive: Some persons other than those who came to grief | are | persons who paid heed to the warning.

424. $S \equiv$ traders; $S' \equiv$ non-traders; $P \equiv$ visiting that locality; $P' \equiv$ non-visiting that locality.
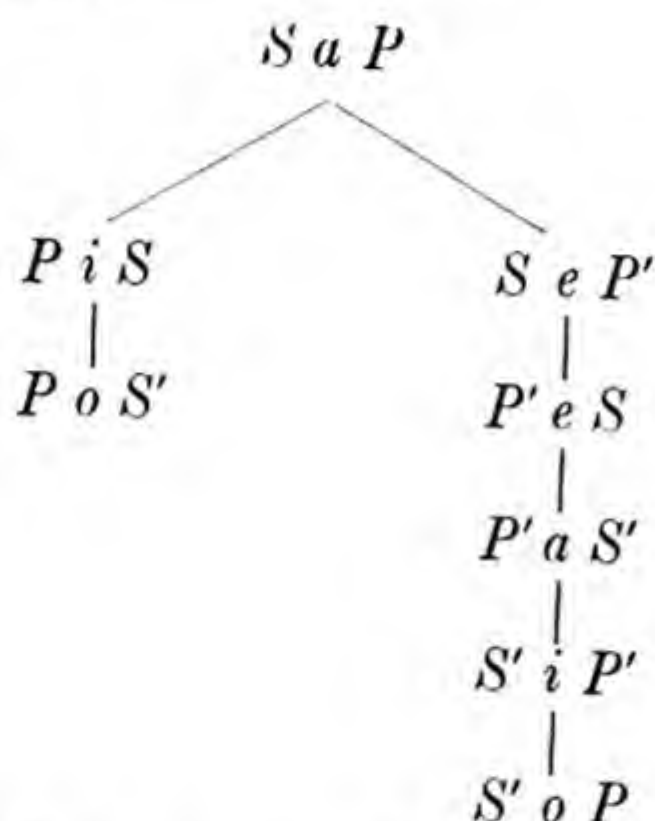
Given

$$S\ i\ P$$

$$P\ i\ S \qquad S\ o\ P'$$

$$P\ o\ S'$$

(a) $\equiv P\ o\ S'$ = obverted converse of given.
(b) $\equiv S\ a\ P$ = subalternans of given.
(c) $\equiv S\ o\ P'$ = obverse of given.

425. $S \equiv$ dealers; $S' \equiv$ non-dealers; $P \equiv$ producers; $P' \equiv$ non-producers.

Given $S \; a \; P$

$$P \; i \; S \qquad\qquad S \; e \; P'$$
$$|\qquad\qquad\qquad\qquad |$$
$$P \; o \; S' \qquad\qquad P' \; e \; S$$
$$|$$
$$P' \; a \; S'$$
$$|$$
$$S' \; i \; P'$$
$$|$$
$$S' \; o \; P$$

$(a) \equiv P' \, e \, S =$ contrapositive of given.

$(b) \equiv P \, o \, S' =$ obverted converse of given.

$(c) \equiv S \, i \, P' =$ contradictory of obverse of given.

$(d) \equiv S \, o \, P' =$ subaltern of obverse of given.

426. (a) Some men | are | masters of their fate.

Contradictory: No men | are | masters of their fate.

Obverse: Some men | are not | other than masters of their
  fate.

 (b) The number of election promises that are broken |
   is | very large.

Contradictory: The number of election promises that are
  broken | is not | very large.

Obverse: The number . . . broken | is not | other than very
  large.

 (c) All cases of the sum of the angles of the triangle |
   are | cases of two right angles.

Contradictory: Some cases . . . triangle | are not | cases of
  two right angles.

Obverse: No cases . . . triangle | are | other than cases of
  two right angles.

 (d) All sympathy | is | necessarily limited by insight.

Contradictory: Some sympathy | is not | necessarily limited by insight.

Obverse: No sympathy | is | not necessarily limited by insight.

427. Making use of the usual symbolism we get:

(a) $S'\ e\ P$; (b) $P'\ o\ S$; (c) $S'\ e\ P$; (d) $S\ o\ P'$.

(Note: " In favour of " and " advocate " are regarded as equivalent; " opposed to " is taken as contradictory of " advocate "; " Free-trader " is taken as contradictory of " Tariff-reformer "; " Liberal " is taken as equivalent to " Non-Tory.")

Then:

(a) and (c) are subalternants of obverted contrapositive of (b), and their converse is the subalternant of the obverted contrapositive of (d).

(b) is the obverted contrapositive of (a) and (c), while (b) and (d) are sometimes called sub-complementaries.

(c) and (a) are the same proposition.

(d) is the obverted inverse of (a) and (c), and the sub-complementary of (b).

428. (a) The naval supremacy of England | is | a thing that is undisputed   A (singular).

Contradictory: The naval supremacy of England | is not | a thing which is undisputed.

Contrapositive: No thing which is not undisputed | is | the naval supremacy of England.

(b) All men | are | persons who sometimes lose their temper.

Contradictory: Some men | are not | persons who sometimes lose their temper.

Contrapositive: No persons who do not sometimes lose their temper | are | men.

(c) Some who applaud | are not | sincere.

Contradictory: All who applaud | are | sincere.

Contrapositive: Some non-sincere people | are | persons who applaud.

429. W. & M., 65, 103, 104.

430. (*a*) No Arabian perfumes | are | able to sweeten this little hand.

Contradictory: Some Arabian perfumes | are | able . . . hand.

Contrary: All Arabian perfumes | are | able . . . hand.

   (*b*) All non-graduate students | are | absent.

Contradictory: Some non-graduate students | are not | absent.

Contrary: No non-graduate students | are | absent.

   (*c*) Some people who do not work hard | are | people who rise to eminent positions.

Contradictory: No people who do not . . . hard | are | people . . . positions.

(sub)Contrary: Some people who do not . . . hard | are not | people . . . positions.

431. W. & M., 115–19.

   (i) By contradiction: Some men are not dishonest.

   (ii) By contrariety: No men are dishonest.

Contradictory opposition is stronger than contrary opposition, as it is more difficult to refute.

432. $S \equiv$ persevering; $S' \equiv$ non-persevering; $P \equiv$ successful; $P' \equiv$ non-successful. Then, given $S \ a \ P$,

   (*a*) $\equiv S \ i \ P$ = sublatern of given.

   (*b*) $\equiv S \ i \ P'$ = contradictory of obverse of given.

   (*c*) $\equiv P' \ e \ S$ = contrapositive of given.

   (*d*) $\equiv S' \ i \ P'$ = obverted inverse of given.

433. (*a*) Some who cannot eat | are | people who have meat.

Contradictory: None who cannot eat | are | people who have meat.

Converse: Some who have meat | are | people who cannot eat.

Contrapositive: None.

(*b*) No man | is | a hero to his valet.

Contradictory: Some men | are | heroes to their valets.

Converse: No person that is a hero in the eyes of his valet | is | a master.

Contrapositive: Some persons other than heroes to their valets | are | masters.

(*c*) All others | are | people who abide our question.

Contradictory: Some others | are not | people who abide our question.

Converse: Some people who abide our question | are | other (than Shakespeare).

Contrapositive: No people who do not abide our question | are | other (than Shakespeare).

434. (*a*) All lovers | are | persons who loved at first sight.

Converse: Some persons who loved at first sight | are | lovers.

Obverse: No lovers | are | other than persons who loved at first sight.

Contrapositive: No persons who did not love at first sight | are | lovers.

(*b*) No non-truth | is | enduring.

Converse: No enduring things | are | other than truth.

Obverse: All non-truth | is | other than enduring.

Contrapositive: Some things non-enduring | are | other than truth.

The given proposition may also be expressed as "All that is enduring | is | truth."

(*c*) Some learned men | are not | wise.

Converse: None.

Obverse: Some learned men | are | other than wise.

Contrapositive: Some people other than wise | are | learned.

(*d*) All Crimson Ramblers | are | roses which climb.

Converse: Some roses which climb | are | Crimson Ramblers.

Obverse: No Crimson Ramblers | are | other than climbing roses.

Contrapositive: No things other than climbing roses | are | Crimson Ramblers.

435. (*a*) This is best taken as—

Some electors | are | persons who voted.

Obverse: Some electors | are not | persons who did not vote.

Contrapositive: None.

(*b*) All the water in the rough rude sea | is | unable to wash the balm from an anointed king.

Obverse: All the water . . . sea | is not | able to wash . . . king.

Contrapositive: Nothing able to wash the balm . . . king | is | all the water in . . . sea.

(*c*) All places visited by the eye of heaven | are | ports and happy havens to the wise man.

Obverse: No places . . . heaven | are | other than ports . . . man.

Contrapositive: No places other than ports . . . man | are | places visited . . . heaven.

436. (1) (*a*) No soldiers who are not young | are | soldiers who run away.

(*b*) No young soldiers not in their first engagements | are | soldiers who run away.

Converse: (*a*) No soldiers who run away | are | not-young soldiers.

(*b*) No soldiers who run away | are | young soldiers not in their first engagements.

Contrapositive: (*a*) Some soldiers who do not run away | are | soldiers who are not young.

(*b*) Some soldiers who do not run away | are | young soldiers not in their first engagements.

(2) All starvation wages | are | to be preferred to no wages.

Converse: Some things to be preferred to no wages | are | starvation wages.

Contrapositive: No things not to be preferred to no wages | are | starvation wages.

(3) All earth's riches | are | unable to bring happiness.

Converse: Some things unable to bring happiness | are | earth's riches.

Contrapositive: Nothing not-unable to bring happiness | is | the riches of earth.

(4) Some men | are not | humorous.

Converse: None.

Contrapositive: Some non-humorous persons | are | men.

437. W. & M., 110–12, 113, 114, 124, 125, 132, 133.

438. W. & M., 32, 33, 115–19.

439. W. & M., 14, 15.

Illustrate by reference to rules of Opposition.

440. W. & M., 104, 120, 121. See also 406 and 429 above.

441. W. & M., 129–34.

442. (*a*) All merry people | are | able to get through life well.

Converse: Some able to get through life well | are | merry.

Obverted converse: Some able to get through life well | are not | non-merry.

Obverse: No merry people | are | unable to get through life well.

Contrapositive: None unable to get through life well | are | merry.

Obverted Contrapositive: All unable to get through life well | are | non-merry.

Inverse: Some non-merry people | are not | able to get through life well.

Obverted: Some non-merry people | are | unable to get through life well.

(*b*) No non-resisting object | is | able to afford support.

Obverse: All non-resisting objects | are | unable to afford support.

Contrapositive: Some things unable to afford support | are | non-resisting.

Converse: Nothing able to afford support | is | non-resisting.

Obverted converse: All things able to afford support | are | resisting.

Inverse: Some resisting things | are | able to afford support.

Obverted inverse: Some resisting things | are not | unable to afford support.

443. (*a*) Some despots | are not | cruel.

Contradictory: All despots | are | cruel.

Converse: None.

Contrapositive: Some non-cruel people | are | despots.

(*b*) No non-philosophers | are | unable to see the difference between a post and my ideal of a post.

Contradictory: Some non-philosophers | are | unable to see . . . post.

Converse: No people unable to see . . . post | are | non-philosophers.

Contrapositive: Some people able to see . . . post | are | non-philosophers.

Or the given proposition may be thus expressed: "All unable to see . . . | are | philosophers."

(*c*) All people who are down | are | free from fear of a foe.

Contradictory: Some people who are down | are not | free from fear of a foe.

Converse: Some who are free from fear of a foe | are | people who are down.

Contrapositive: None who are free from fear of a foe | are | people who are down.

444. (*a*) Some who were present | is | a person who failed to understand what was said.

Contradictory: None who was present | are | people who failed to understand what was said.

Obverse: Some who were present | are not | people who did not fail to understand what was said.

Contrapositive: There is none.

(*b*) No persons without special permission | are | persons to be admitted.

Contradictory: Some persons without special permission | are | persons to be admitted.

Obverse: All persons without special permission | are | persons not to be admitted.

Contrapositive: Some persons not to be admitted | are | persons without special permission.

(c) Lycidas | is | dead.

Contradictory (secondary): Lycidas | is not | dead.

Obverse: Lycidas | is not | other than dead (*i.e.* alive).

Contrapositive: A person not-dead (*i.e.* alive) | is not | Lycidas.

(d) No cases of A which is B | are | cases of C which is D.

Contradictory: Some cases of A which is B | are | cases of C which is D.

Obverse: All cases of A which is B | are | other than cases of C which is D.

Contrapositive: Some cases other than cases of C which is D | are | cases of A which is B.

CHAPTER V.

THE SYLLOGISM.

§ 1.

501. W. & M., 144, 151, 153. (The sufficient ones are under B & C.)

502. (a) W. & M., 163, 164.

(b) In Fig. I. M is predicate of the minor, so that if it is to be distributed therein the minor must be negative.

Then the conclusion is negative.

∴ P must be distributed in the major premise.

∴ the major premise must be negative.

But no conclusion follows from two negative premises.

Again, in Fig. II., M is predicate in both premises, so that if it is distributed twice both premises must be negative.

But that is impossible.

503. W. & M., 150–2.

The given argument is:

> No free agents are irresponsible.
> All men are free agents.
> ∴ No men are irresponsible.

Here " irresponsibility " is predicated negatively of the class " free agents," and " man " is asserted to belong to that class; thus " irresponsibility " may be predicated in like manner of " man."

504. O is the minor premise.

∴ The conclusion must be negative and particular.

∴ P must be distributed in the major premise.

But the major must be affirmative, and hence it must be of the form $P \, a \, M$.

∴ M must be distributed in the minor premise, and so must be the predicate.

∴ The form of the minor is $S \, o \, M$.

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This gives:

$$P \, a \, M$$
$$S \, o \, M$$
$$\therefore \ S \, o \, P,$$

or A O O, Fig. II.

505. W. & M., 152, 153.

Fig. IV. is of form

$$P—M$$
$$M—S$$
$$\therefore \ S—P.$$

If M is distributed in the major premise, the major premise must be negative.

Therefore if M is distributed in the minor premise, the minor premise must be universal affirmative.

Then S is undistributed in the minor premise, and must also be undistributed in the conclusion. But since the major is negative, the conclusion must be negative.

Therefore the conclusion is particular negative.

506. Conclusion is E.

Therefore one premise must be negative and the other will be affirmative. Both must be universal.

Both major and minor terms are distributed, and the middle term must be distributed also.

In the E premise the order of terms is immaterial, but the extreme appearing in the A premise must be distributed, *i.e.* must be subject. Thus we get:—

$M \, e \, P$	$P \, e \, M$	$P \, a \, M$	$P \, a \, M$
$S \, a \, M$	$S \, a \, M$	$M \, e \, S$	$S \, e \, M$
$\therefore \ S \, e \, P$	$\therefore \ S \, e \, P$	$\therefore \ S \, e \, P$	$\therefore \ S \, e \, P$

The possible Figs. are thus I., II., or IV.

Fig. III. is excluded because the given conditions would involve two negative premises, or else illicit process.

507. (*a*) W. & M., 163, 168, 169.

(*b*) The form of Fig. I. is

$$M—P$$
$$S—M$$
$$\therefore \ S—P.$$

The major cannot be O, for then M must be distributed in

K. L. E.

4

the minor, *i.e.* the minor must be negative, and that would give two negative premises.

The minor cannot be O, for in that case the major must be affirmative, but the conclusion negative, and that would give illicit process of the major term.

Therefore O cannot be a premise in Fig. 1.

508. We must supply the major premise:

No knowledge that is useful for students of science | is | knowledge that does not improve the faculty of observation.

Knowledge of Greek | is | knowledge that does not improve the faculty of observation.

∴ Knowledge of Greek | is not | useful for students of science.

This is Cesare, Fig. II. To reduce to Fig. I. simply convert the major premise:—

No knowledge that does not improve the faculty of observation | is | useful knowledge for students of science.

Knowledge of Greek | is | knowledge that does not improve the faculty of observation.

∴ Knowledge of Greek | is not | useful for students of science.

This is Celarent, Fig. I.

509. W. & M., 163.

510. (i) Some tigers | are not | man-eaters.

All tigers | are | striped.

∴ Some striped creatures | are man-eaters.

This is O A I. It is invalid. A negative premise requires a negative conclusion.

(ii) All insects have six legs.

No spiders have six legs.

∴ No spiders are insects.

This is A E E, Fig. II., and is valid. As given, the argument is an enthymeme of the second order.

511. (*a*) Given conclusion is *S a P*.

Therefore both premises are affirmative and one at least is universal.

S is distributed in the conclusion and so must be distributed in the minor premise, which is therefore universal affirmative ($S\ a\ M$); M, being undistributed in the minor, must be distributed in and therefore subject of the major, which must also be universal affirmative.

Therefore the required form is

$$M\ a\ P$$
$$S\ a\ M$$
$$\therefore\ S\ a\ P.$$

or A A A in Fig. I.

(b) In I E one premise is negative.

$\therefore$ conclusion must be negative.

$\therefore$ P must be distributed in the major premise.

But the major is I.

Hence there is illicit process of the major term.

$\therefore$ No conclusion is possible.

512. (i) Some controversies | are | wearisome.

No controversies | are | soothing.

$\therefore$ Some soothing occupations | are not | wearisome.

Invalid. Illicit process of the major.

(ii) All superfluous things | are | ineffective.

Some amusements | are not | ineffective.

$\therefore$ Some amusements | are not | superfluous.

This is A O O, Fig. II., and is valid.

(iii) All accidental circumstances | are | entirely non-moral.

Some accidental circumstances | are | fateful.

$\therefore$ Some fateful events | are | entirely non-moral.

This is A I I, Fig. III., and is valid.

513. (a) W. & M., 159.

(b) W. & M., 163.

(c) The major is O.

$\therefore$ The conclusion is negative.

$\therefore$ To avoid illicit process P must be predicate in the major premise.

But the minor premise is affirmative.

And to secure the distribution of M it must be universal and have M for subject.

This gives us:

$$M\ o\ P$$
$$M\ a\ S$$
$$\therefore\ S\ o\ P$$

which is O A O, Fig. III.

514. (*a*) W. & M., 223, 224.

     (*b*) W. & M., 163, 164.

515. W. & M., 179-85.

Given argument is:

        No non-members are admitted.

        All graduates are non-members.

      $\therefore$ No graduates are admitted.

This is already in E A E, Fig. I., and cannot be reduced to any other mood of Fig. I. indirectly.

516. (*a*) If the minor premise is negative the conclusion must be negative.

Therefore P must be distributed in its premise.

But by hypothesis P is the predicate in the major premise.

Therefore the major must be negative.

But that gives two negative premises, which is impossible.

517. W. & M., 179-81, 184.

518. (*a*) All men are mortal.

        All men are embodied spirits.

     $\therefore$ All embodied spirits are mortal.

This involves illicit process of the minor term.

     (*b*) All who work hard are happy.

        Some do work hard.

     $\therefore$ Some are happy.

Valid.   A I I, Fig. I.

     (*c*) No non-officials voted.

     $\equiv$ All voters are officials.

        You are an official.

     $\therefore$ You are a voter.

Invalid.   Undistributed Middle Term.

(*d*) Some boys object to fielding.

All boys like batting.

∴ Some who like batting object to fielding.

Valid. I A I, Fig. III. But the minor above is the obverse of the form given.

(*e*) There is no syllogistic argument. The two series of facts referred to are really quite different. We cannot certainly pass from the truth of a subaltern to that of a subalternans. All we could say here would be that at least the "some" referred to in the original statement will have cause to rejoice. Or the argument might be charged with the fallacy of *a dicto secundum quid ad dictum simpliciter*.

(*f*) All cats are intelligent.

No intelligent creatures are brainless.

∴ Some brainless creatures are not cats.

Valid. A E O, Fig. IV., weakened form of A E E.

(*g*) Some happy memories are sad.

All memories we linger over are happy.

∴ Some memories we linger over are sad.

Invalid. I A I, Fig. I. Undistributed Middle.

(*h*) Obvert the given minor and add a major premise, and we get:

All dissatisfied people are unhappy.

All men are dissatisfied.

∴ All men are unhappy.

Valid. A A A, Fig. I.

519. Conclusion is particular negative.

Therefore one premise is negative.

But P must be distributed in the major, and so must M.

Therefore the major is universal negative.

And M has to be distributed in the minor; hence the minor must be A with M for its subject.

This gives us:

$$M \, e \, P \qquad\qquad P \, e \, M$$
$$M \, a \, S \qquad\qquad M \, a \, S$$
$$\therefore S \, o \, P \qquad\qquad \therefore S \, o \, P$$

E A O, Fig. III., and E A O, Fig. IV.

520. W. & M., 163, 181–3.

521. W. & M., 150, 151.

522. W. & M., 215–21.

523. (i) Fig. III. with its particular, or Fig. II. with its
        negative conclusions.

   (ii) Fig. II., with its negative conclusions.

   (iii) Fig. I.

524. W. & M., 215–21.

The general result would be to make us hold that we could
not tell without special knowledge whether a syllogism com-
mitted the fallacy of *petitio principii* or not.   The possibility
would remain.

525. (i) Let the major be affirmative.

Then the conclusion is negative.

Therefore P must be distributed in the major.

Therefore P must be the subject of an A proposition.

But the conclusion must therefore be E.

Therefore S also must be distributed.

And the minor must be negative and universal.

Therefore we get

$$P\,a\,M \qquad\qquad P\,a\,M$$
$$M\,e\,S \qquad\qquad S\,e\,M$$
$$\therefore S\,e\,P \qquad\qquad \therefore S\,e\,P$$

i.e. A E E, Fig. IV., and A E E, Fig. II.

   (ii) Let the major be negative.

Then the conclusion must be affirmative.

But this is impossible.

Therefore the above moods are the only possible ones.

526. W. & M., 156–9.

527. W. & M., 192.

528. W. & M., 165–7.

529. A E E is invalid in Figs. I. and III., for it would lead
to illicit process of the major term.

   O A O involves undistributed middle in Figs. I. and II.,
and illicit major in Fig. IV.

E I O is valid in any figure, for whatever the order of terms in E the necessary distribution is secured.

I E O involves illicit process of the major in every figure.

530. (a) W. & M., 163.
     (b) W. & M., 164.

531. W. & M., 180–4.

532. (a) W. & M., 163, 164.
     (b) W. & M., 164.

533. W. & M., 150–2, 163.

534. X and Y are two premises proving Z.

One of the premises is known to be false and the other true. The problem is, when, if ever, can the contradictory of the false premise, together with the true premise, prove the contradictory of Z?

Let Y be the true, and hence the common premise; then X' will be the contradictory of the false premise.

Then Y must be affirmative and universal, or either XY or $X'Y$ will give two negative, or two particular, premises.

And since M will be undistributed either in X or X', M must be subject of Y.

Therefore the extreme in Y is undistributed, and so must be undistributed in the conclusion of which Y is a premise.

But any term undistributed in Z will be distributed in its contradictory Z'.

Therefore one of the two syllogisms will contain illicit process, and hence under the given circumstances we cannot formally infer the falsity of the conclusion.

535. By hypothesis the major term is distributed in its premise but undistributed in the conclusion.

∴ The conclusion must be affirmative.

∴ Both premises are affirmative.

And P must be subject of an A proposition.

∴ The major premise is of form $P\,a\,M$.

But M must be distributed once at least.

∴ M must be subject in the minor, this also being an A proposition of the form $M\,a\,S$.

We thus get: $P \, a \, M$

$M \, a \, S$

$\therefore \, S \, i \, P.$

A A I, Fig. IV.

536. W. & M., 216–21.

537. W. & M., 181–5.

538. W. & M., 163.
Prove either:

(1) By direct application of the suitable *dicta*; *or*

(2) By application of the fundamental syllogistic rules to the special figures in question.

(3) By application of the special canons of the figures.

539. W. & M., 153.
If a premise is particular negative, the conclusion must be particular negative.

Then P must be distributed, and so must M.

So if the major premise is O, the minor must be A, and the arrangement of terms:—

$M \, o \, P, \; M \, a \, S, \;\; \therefore \, S \, o \, P$:—O A O, Fig. III.

If the major is affirmative it must be A; and M must be distributed in the minor, which by hypothesis is O.

$\therefore$ We get $P \, a \, M, \; S \, o \, M, \;\; \therefore \, S \, o \, P$:—A O O, Fig. II.

540. (*a*) W. & M., 154, 155.

(*b*) W. & M., 155, 156.
W. & M., 161–4.

541. W. & M., 110–12, 144–7, 150–2.

542. W. & M., 179–85.

543. W. & M., 215–21.

544. (*a*) W. & M., 221–3.

(*b*) If we take " most " in its strict sense of " more than half," the conclusion follows.   De Morgan proposed a development of Logic which should consider numerically definite

propositions. For the most part this is not very important, though arguments of the form here given are fairly common.

(c) All things that no man is able to prevent | are | things that no man need lament.

Death | is | a thing that no man is able to prevent.

∴ Death | is | a thing which no man need lament.

This is A A A, Fig. I., and is valid.

The principle involved may be expressed thus:—

"If all members of a class possess (or lack) a property, and if certain objects are included in that class, then those objects must possess (or lack) that property."

545. (a) W. & M., 158, 159.

(b) W. & M., 161–4.

(c) W. & M., 187, 188.

546. In a valid syllogism if the conclusion is false at least one of the premises must be false. For the conclusion follows from the premises and does not go beyond them.

It may appear to be the case that the premises are false and the conclusion true, as in:

All donkeys are yellow.

All donkeys are daffodils.

∴ Some daffodils are yellow.

But in reality the conclusion is not proved by the premises at all. If the conclusion is considered *solely* in relation to the premises, it is just as false as they are.

The same holds of the third case. The most common instance is where the major is a false generalisation. Thus:

All men are liars.

B is a man.

∴ B is a liar.

The conclusion and the minor premise may be true while the major premise is false. But here also the conclusion cannot be said to be established through the universal relation given in the major. The major is an empirical generalisation, and in so far as it covers the conclusion, B must have been used to establish it.

§ 2.

601. W. & M., 187, 188.

" When expressed in categorical form the fallacy of denying the antecedent and of affirming the consequent in a hypothetical argument is equivalent respectively to Illicit Major and Undistributed Middle, when the hypothetical premise is *affirmative*; when it is *negative*, both fallacies are equivalent to ' two negative premises.' "—T. B. Muller.

602. (*a*) If there is no work to be had, a sea trip is out of the question.

And a sea trip *is* out of the question.

∴ No work is to be had.

Mixed hypothetical syllogism; fallacy of affirming the consequent.

(*b*) We get: It is true that,

Some apes are not tailless = Some apes | are | not without a tail = Some apes are tailed. Also: This creature is tailed. The given conclusion is: This creature is an ape. Thus the argument commits the fallacy of Undistributed Middle.

603. If there is censorship of the Press, truth will not be sacrificed to sensation; and if there is no censorship, abuses that should be exposed will not be hushed up.

But there must be either censorship or not.

∴ Either truth will not be sacrificed to sensation, or abuses that should be exposed will not be hushed up.

604. W. & M., 189, 190.

605. Assuming that X is a man, then,

(i) if the enumeration of alternatives is exhaustive, X has gained no degree;

(ii) by *modus ponendo ponens* of the constructive hypothetical syllogism, X has gained a degree.

606. W. & M., 175-7, 186-93.

We can argue: " If a triangle is equilateral it is equiangular, but this triangle is equiangular, and therefore it is equilateral," because our knowledge of the material conditions informs us that this relation is reciprocal.

607. W. & M., 93–5, 194, 195.

Modus ponendo tollens in the mixed disjunctive syllogism is valid only when the alternatives are mutually exclusive.

608. W. & M., 193 (the question is no doubt concerned with a *mixed* disjunctive syllogism), 197–204.

The general question is: " Shall the franchise be given to those who do not now possess it ? " The argument is a complex constructive dilemma. But it may be rebutted thus:

Those who agitate are not indifferent, and those who do not agitate deserve it. But all of these people either agitate or do not agitate. Therefore in any case they should have the franchise.

The dilemma (*a*) begs the question by putting *all* agitators into one class irrespective of their methods, and *all* quiet people into another class irrespective of their character.

(*b*) Assumes that the basis of the franchise is either good behaviour or a desire to have it, and ignores the real ground —possession of citizenship.

609. W. & M., 193–5.

The " one form " referred to is the *modus ponendo tollens* (see 607 above).

610. We may write in logical form:—

> If a tax is productive it is legitimate.
> The window tax is not legitimate.
> ∴ The window tax is not productive.

Mixed hypothetical syllogism. Valid. *Modus tollendo tollens* of the Destructive form.

Leaving aside the tautology of the minor, what we get is:

> If a person drowns himself wittingly he performs an act.
> This person has performed an act.
> ∴ This person has drowned herself wittingly.

Fallacy of affirming the consequent.

611. W. & M., 207–14.

612. W. & M., 205, 206.

613. W. & M., 205, 206.

614. W. & M., 209–13.

615. W. & M., 213, 214.

616. Let the conclusion, if possible, be universal.

Then it distributes either one or two terms according as it is affirmative or negative.

Therefore the premises must, by hypothesis, distribute either three or four terms.

They cannot distribute four terms, for that would involve two negative premises.

And if they distribute three terms one of the premises must be negative.

Then the conclusion must be negative.

But it has already been shown that it cannot be universal negative (as we cannot distribute four terms).

∴ The conclusion cannot be universal if the middle term is twice distributed.

617. W. & M., 189, 190.

618. (a) W. & M., 187–90.

   (b) W. & M., 193–7.

619. We can always reduce mixed hypothetical syllogisms to categorical form by using " the case of."

Thus—

If A, then C

A

∴ C

reduces to: All cases of A are cases of C.

This is a case of A.

∴ This is a case of C.

The Constructive form reduces to syllogisms in Fig. I. and the Destructive form to syllogisms in Fig. II.

But the essentially hypothetical nature of the reasoning remains.

620. W. & M., 205, 206, 209.

(a) If there is a big vote for the bad candidates, party feeling must have been running high.

There is a big vote for the bad candidates.

∴ Party feeling must have been running high.

(*b*) Nobody who does not break the law is imprisoned.

You do not break the law.

∴ You are not imprisoned.

E A E, Fig. I.

(Or the major may be expressed as: " All those imprisoned are law-breakers.")

(*c*) If we die we shall be honoured (for our country will feel our loss), and if we live we shall be honoured (for there will be few survivors and enough honour to go round).

But either we die or we live.

∴ In any case we shall be honoured.

Simple Constructive Dilemma.

621. W. & M., 90, 91, 92, 93.

CHAPTER VI.

INFERENCE IN GENERAL.

651. W. & M., 238–40, 275–7.

652. (*a*) W. & M., 111.

    (*b*) W. & M., 111, 112.

653. W. & M., 223, 238–40, 275–7.

654. W. & M., 216–21.

It is only when enumeration is used to help to establish the major premise, and the instance brought forward in the conclusion is one of the very cases used for that purpose, that it can be said that the conclusion is asserted when the major premise is admitted.

655. W. & M., 236–8.

In induction especially, we do extend the range of application of the principles illustrated in the premise.

656. W. & M., 230, 231, 244–6. (See No. 68.)

The reference is to the distinction between analytic and synthetic propositions. It is urged that the propositions of mathematics (as illustrated by the case given) are not a mere unfolding of the meaning of the terms given, but convey real knowledge. In the second case, however, " injustice " is defined as " violation of property," and property would be held to imply the settled holding of personal possessions. The proposition would then reduce to: " Where there is no possession held, there can be no violation of such possession," and the whole may be regarded as a mere tautology.

Really, however, no significant statement can be reduced to a mere tautology.

All judgments are (1) synthetic, as containing a predication which in relation to the subject may be regarded as relatively new; (2) analytic, as connecting this new fact with previous knowledge.

657. W. & M., 111.

    (i) W. & M., 114, 115.

    (ii) W. & M., 126-9.

    (iii) W. & M., 135.

(i) is the *subaltern*, and would be generally recognised as covered by any definition of immediate inference.

(ii) is the *obverse*. Some have objected that this is not immediate. But by emphasising the inter-relation of affirmation and negation we may allow that it comes under the scope of Welton's definition.

(iii) is the obverted contrapositive, and comes under Welton's definition.

The final contention refers to the doctrine that negation is not ultimate, and that the significance of negation may be seen only when its positive nature is fully grasped. It is true that negation involves affirmation, but it is untrue that negation must, or may, always be reduced to affirmation.

658. W. & M., 6, 7, 236-8.

The main difference is that while in formal inference we are working according to fixed rules within a relatively-closed, simple, and stable system, in material inference the system is the real world itself, and the data are far more complex and lacking in stability. Thus in the former case the main emphasis is upon self-consistency, but in the latter on truth.

659. In the game of chess the system is relatively small, is isolated, is governed by known rules, and consists of factors whose relations one to another are familiar to us.

The scientific investigator has on the other hand to deal with far wider systems, the limits of which are hardly known, the constituents of which are endlessly various, the relations within which are constantly changing, and the laws governing which are but partially and inadequately apprehended.

660. W. & M., 215-21.

661. " The ordinary school or formal logic can lay no claim to scientific completeness; its principles are imperfect, dubious, and most variously conceived; it possesses no method by

which development from those principles is possible; it has no criterion by which to test the adequacy of its abstract forms as representatives of the laws of concrete thinking."—Adamson.

662. W. & M., 274–7.

663. W. & M., 215–21.
The position that is to be adopted on this question must depend on the definition of inference which is accepted.

664. There is no necessary inconsistency. (1) says: " The major premise does not *prove* the conclusion, but the conclusion is formulated according to the general principle illustrated in the major premise." It does not argue that we must, and does not, so far as this quotation goes, even suggest that we *may* do without the major premise.

(2) says: " We must have the major, and the major must be true." It says nothing about *how*, if the conclusion *is* true, the conclusion follows from that major. In fact it says nothing at all about the way in which the conclusion of a syllogistic argument is derived.

665. W. & M., 110, 111, 236–8.
Instances of *propria* are: Studied in logic; involving effort of thought; going beyond premises.
Instances of separable accidents are: of interest to students; forming examination exercises; syllogistic in nature.

CHAPTER VII.

THEORY OF INDUCTION.

§ 1.

701. (a) It enables us to see the way in which logical doctrine has developed, and thus

(b) To understand more thoroughly present-day positions.

(c) It brings us into touch with masters in the science, and thus

(d) Forms a spur to our own thought.

(e) It helps us to appreciate better the unity of Logical doctrine.

(f) By bringing us into touch with varying views it makes our appreciation of the problem of Logic broader.

(g) By enabling us to see the mistakes that have been made it may make us more careful and thorough in our own reflexion upon the problems of Logic.

702. W. & M., 272.

Aristotle's formal work was remarkably complete and good. He had, however, little appreciation of the real scientific nature and value of Induction.

703. W. & M., 6, 7.

The Scholastic logic, while in many respects wonderfully acute and subtle, was yet almost wholly formal, and largely a matter of the use of hair-splitting distinctions. It formed a hide-bound system, which tended to clog and hinder the advance of knowledge.

704. Bacon's view of nature is that bodies consist of " simple natures," of which *the form = the essence.* Induction aims at discovering " form," and proceeds by rejections and exclusions. There are three steps: (1) Collection of instances; (2) Sorting of instances; (3) Exclusion and rejection. (See also *Logic Exercises*, 85, 86.)

705. Bacon's instance sought to exclude a non-cause, but Mill's experiment to establish a cause.

706. Bacon professes to scorn hypothesis; but the part of his procedure concerned with the sorting of instances necessarily involves hypotheses.

Again, the fact that the Baconian proposals are very rarely applied is partly due to the small place which they give to hypothesis.

707. By giving far greater prominence to the work of mind; by seeking causal relations instead of simple forms; by being a good deal less utilitarian; by pushing through a more complete analysis, and admitting the very great importance of hypothesis.

708. W. & M., 327.

He opposed the unfounded and unverifiable guesses of the Schoolmen, not the rational hypotheses of which science makes frequent use.

(a) That the wanderings of Mars were due to the vagaries of some capricious spirit.

(b) That the perturbations of Uranus were due to the disturbing influence of some other planet yet more remote.

709. W. & M., 281-3.

710. Refer to Mill's empiricism as expressed in his treatment of the Uniformity of Nature, and the law of Causation, and of " necessary " truth. Discuss his methods. Show the value of a great deal of his work, and how constantly a more " rational " doctrine seemed about to gain the upper hand in his teaching.

711. In illustration might be used Mill's treatment of analogy, or his distinction between uniformities of sequence, and of co-existence.

712. W. & M., 453-5.

Mill's position is not satisfactory, for it leaves the necessity and universality of mathematical truth open to doubt.

713. W. & M., 278-81.

714. *Whewell* regards induction as the whole process of establishing general propositions. The essence of induction is the " colligation of facts " by an appropriate " conception." Whewell's " conceptions " = hypotheses, which are confirmed by agreement with facts, and especially by a " consilience of inductions." The Logic of Induction is the criterion of Truth inferred from facts. There are two stages of Inductive Inference: (1) Induction of laws; (2) Induction of causes. The former has three stages: (*a*) Selection of ideas; (*b*) Construction of conception; (*c*) Determination of magnitude. These must be followed by verification.

Bring out the importance to Whewell of colligation of facts (*i.e.* the banding of them into a unity) by means of appropriate Conceptions.

715. Jevons' conception is inadequate, since he starts from an empirical view of the universe. Hence induction is essentially enumerative, and the results of imperfect induction are only probable. He bases imperfect inductions on the Theory of Probability.

716. Bacon's method, which was definitely mechanical, has been little used. While science does endeavour to keep free from prejudice, it recognises the very great importance of hypothesis and the work of mind which this involves.

717. W. & M., 274–7. (See No. 715.)

718. The main reason is that the complexity and variety of nature render enumeration impossible, and even if this were not so, enumeration itself cannot establish connection of content. We need most careful analysis of phenomena to do that.

719. W. & M., 270–4.

720. (i) The importance of the appeal to experience.

(ii) The impossibility of a purely empirical basis for Inductive Logic.

(iii) The fundamental value of analysis.

(iv) The fact that Induction and Deduction must go hand in hand to produce the best work.

§ 2.

751. W. & M., 270-3.

752. (a) W. & M., 283-7.

　　　(b) W. & M., 351, 355, 357.

In the popular sense of cause and effect " Plurality of Causes" holds good, but if the effect is carefully analysed the doctrine ceases to have any foundation.

753. W. & M., 276, 322, 323, 329-32.

754. W. & M., 283-7.

755. W. & M., 278-89.

The reference is to the Uniformity of Nature. Show that it is not a mere generalisation from repeated experience, but it is a rational principle expressing a condition of thought itself.

756. W. & M., 331, 332.

757. " Verification " is frequently used of the whole process of testing hypotheses; " proof " is a narrower term and is used of the *establishment* of hypotheses.

758. W. & M., 301-3.

759. (i) A barren hypothesis is one which lacks a foundation of fact and can accordingly be neither established nor rejected.

(ii) W. & M., 348-80.

In a verified hypothesis the relation involved is expressed reciprocally.

760. W. & M., 284-7.

761. W. & M., 270-3, 281-3, 292-5, 309-11.

While appeal to experience is necessary, it must be recognised that the " testimony of the senses " has to be interpreted. The interpretation does not always take the form that a superficial inspection might suggest, as for instance in the case here referred to.

762. W. & M., 328-32, 348.

763. W. & M., 278-83.

764. W. & M., 270-7.

What is meant is that in deduction we are given the principles and work to the results; in induction we are given the results and have to work back to the principle. The expression " inverse relation," however, gives no insight into the nature of the relation concerned. It is notable that valid inductive reasoning involves, as a matter of fact, invalid formal reasoning.

765. W. & M., 278–83.

766. The most adequate of the references given would be to (b) the immediate cause. But (b), in this case, would, in its development, include both (a) and (c) as well as a full analysis of all the relevant conditions. Causation, as applied in the external world, it is to be remembered, has to do, not so much with a particular instance, as with general spatial and temporal relations.

767. W. & M., 283–7.

768. (a) This depends mainly on the nature of the case, and the character of the observer. *Unnoticed* inference is extremely common, and unintentional inference might be taken to include this. What is received by way of sense impressions must be interpreted.

(b) is always at work. It helps to determine with what branch of investigation we shall occupy ourselves, and also what factors in any given complex we shall notice.
W. & M., 290–7.

769. (a) W. & M., 359–64, 451–5, 460.

(b) Jevons enumerates eight classes of exceptional phenomena. In practically all of these cases it is fairly evident how science would set to work.

(1) Imaginary, or false exceptions. These would be ignored.

(2) Apparent, but congruent, exceptions. Careful analysis having shown an exception to be apparent, the exception would form fresh evidence for the hypothesis in question.

(3) Singular exceptions, which exhibit remarkable and unique results of a law of nature.

(4) Divergent exceptions "which really proceed from the ordinary action of known processes of nature, but which are excessive in amount or monstrous in character."

(5) Accidental exceptions, "arising from the interference of some entirely distinct, but known law of nature."

(6) Novel and unexplained exceptions, which bring about the discovery of new laws, modifying previously known principles, but not overthrowing them.

(7) Limiting exceptions restricting the range of application of a law.

(8) Real exceptions which lead to the abandonment of a proposed hypothesis.

An exception is either only apparent, or else, if it is real, it is due to a modification of known principles, or is the expression of hitherto unknown causal relations.

770. W. & M., 329–34, 348–52.

The method of exclusions may be used in some cases, but the scientific mode of establishing hypotheses is primarily positive. Usually the complexity of the subject-matter will make a thoroughly exhaustive process of progressive exclusion impossible.

771. W. & M., 80–5, 283–7, 442, 443.

Classification arranges facts in order; Induction attempts to find reasons for the order.

772. W. & M., 457, 458.

In so far as this means that in both cases the universal principles observed depend upon the securing of certain conditions the statement is true.

773. W. & M., 272.

So far as both are concerned with mere counting this is true; that is, "imperfect induction" is a sort of defeated attempt to obtain a complete enumeration. But neither "imperfect" nor "perfect" counting is really inductive.

The second statement lacks definiteness, for it says nothing concerning the nature of the method of co-ordination.

774. W. & M., 332–4.

The second statement is nearer the truth than the first, but must be applied with great caution.

775. W. & M., 230, 231, 244–6, 452–4, 144–7, 216–20, 274–7.

776. The abstract method is in the main deductive, starting from general principles and arguing to particular applications. Illustrations may be found in mathematics, or in the deductive treatment of economics. The historical method is inductive, but involves also the use of deduction. Illustrations may be well afforded by a historical and statistical treatment of social and economic problems.

777. W. & M., 440–55.

778. " Law " in science means a formulation of a uniform relation, and is descriptive.

" Law " in jurisprudence is a rule of conduct laid down by some authority, usually external, and is prescriptive.

A law of the land is of the second type; a law of nature is of the former, but is distinguished from an empirical law in that it is the result of thorough and adequate analysis. An empirical law is merely a descriptive uniformity which is the result of more or less superficial observation. It is better described as an empirical generalisation.

779. W. & M., 278–83.

A " concrete particular fact of experience " may mean:

(1) Any object regarded as directly perceived through the senses, or

(2) Any constituent of the mental life regarded by itself.

780. W. & M., 281–7.

781. W. & M., 284–7.

Cause and effect are essentially related within one *continuous* process.

782. W. & M., 338–44.

What is meant is that apparently we simply apply a conclusion which we have found true in one case, to another case like the first, but really we use our first instance to suggest a universal relation between the facts dealt with.

783. W. & M., 295, 296, 303–11, 314–19.

784. W. & M., 270–7.

785. See 769 above.

The reasons for supposing exceptions apparent are the reasons for upholding the Unity and Uniformity of Nature.

786. W. & M., 256, 257, 260.

" Deductive science " is here used broadly of the whole process of scientific enquiry, and the arguments to be used against this view are those urged by Welton. (W. & M., Ch. XXV.)

787. W. & M., 452–5.

788. W. & M., 278–87.

789. Usually what is meant is that member of the totality of related events which is most closely precedent in time to the event in question. Another way in which immediate cause is sometimes described is as follows: " Among the ' totality of conditions ' necessary for producing the effect it is that condition with which the effect occurs and without which it does not occur." (Mellone.)

The " immediate cause " may be complex, so that in that respect the event may be said to have more than one such cause. If both immediate cause and event are defined loosely, plurality of causes is possible in this as in every case of " causal relationship."

CHAPTER VIII.

METHOD OF INDUCTION.

851. W. & M., 338–44.

852. W. & M., 349–72.

853. (i) W. & M., 334.

(ii) This is applied when an " exception " turns out to be apparent only, and to afford evidence in favour of the proposed hypothesis.

854. W. & M., 303–11.

855. W. & M., 364–70.

856. W. & M., 336–47.

Mention especially: (a) Enumerative induction.

(b) Analogy.

857. W. & M., 306, 307.

858. W. & M., 352–9.

859. W. & M., 338–44.

860. W. & M., 290–303.

861. W. & M., 359–64.

862. W. & M., 286, 287.

(a) By method of Concomitant Variations.

(b) By the " Indirect " or analytic method (W. & M., 391-9). Most of Mill's methods might be more or less roughly applied at various stages of the investigation of this problem.

863. (a) W. & M., 272.

(b) W. & M., 448-52.

(c) W. & M., 338-44.

864. W. & M., 297–303.
Reference should be made to the experimental methods of Mill, and to their use in Induction.

865. W. & M., 359–64, 370–2.
The Method of Residues involves a closer analysis of the factors involved, and tries to ensure that the suggested hypothesis shall be adequate to account for the whole of the effect. "Subduction" is not by any means always mere subtraction.

866. W. & M., 356–9.
It is sometimes held that this Method is not really a combination of Agreement and Difference, and is therefore better described (with Fowler) as the Double Method of Agreement.

867. W. & M., 297–303.
The essentials are:
    (*a*) Clear perception of the end in view.
    (*b*) Knowledge of the essential relevant conditions.
    (*c*) Complete control of those conditions.

868. W. & M., 338–344.

869. W. & M., 323–6, 327.

870. (*a*) Observe effect; (*b*) analyse its nature; (*c*) suggest a cause; (*d*) work out results by the various experimental and other methods; (*e*) compare these with fact.
Ideally it should always be possible to trace back a given effect to one cause; actually, owing mainly to the complexity of phenomena, it is not always found possible. In some cases the Inverse Method of Probability will be of value.

871. W. & M., 337, 338, 352–9.
The difference is that in the Method of Agreement we do not merely *count* a number of instances, but we analyse them so as to discover constant factors.
In common with the other methods that of Agreement presupposes that the cause of a certain effect is to be found within the range of a fairly definitely assigned group of factors.

872. W. & M., 373–80.

The difficulty consists in the complexity of the phenomena involved, and in the possible presence of factors (*e.g.* purpose, determination) that are not capable of inductive treatment.

The " indirect " method must be applied in this solution.

873. W. & M., 296–301.

874. W. & M., 359–61.

875. W. & M., 364–70.

Every stage in the variation involved may be looked upon as an application of the Method of Difference.

876. W. & M., 338–44, 444–55.

877. A complex phenomenon may be due to the combined results of a number of distinguishable conditions. We may have two main cases: " In the one, which is exemplified by the joint operation of different forces in mechanics, the separate effects of all the causes continue to be produced, but are compounded with one another, and disappear in the total. In the other, illustrated by the case of chemical action, the separate effects cease entirely and are succeeded by phenomena altogether different, and governed by different laws."— (J. S. Mill.) It is to these facts that the expression Inter-mixture of Effects refers. Their investigation, according to Mill, involves the whole " deductive method " with its three steps of hypothesis, ratiocination, and verification. It is clear that the complexity of social phenomena will render this the most common case in this realm. For instance, there is likely to be much intermixture of effects discovered in an investigation of conditions of poverty.

878. W. & M., 276, 322–35, 348–52.

879. W. & M., 364–70.

The reference is obviously to the method of Concomitant Variations. Brief notice of the general nature of quantitative determination might be given.

880. W. & M., 291–5.

It is true that observation involves a certain amount of selection, isolation, and interpretation, and that means that

it must be more or less definitely guided by purpose. But to say that it "presupposes correct theory" is to go a little too far.

881. W. & M., 328, 329, 348–52.

882. W. & M., 370–2.

883. (a) Experiment would be used and, if possible, the Method of Difference.

(b) Deduction from astronomical data.

(c) Observation, with whatever analysis is possible; Methods of Difference and Concomitant Variations might be roughly applicable. Generalisations concerning social phenomena would also probably be used.

(d) Very much the same as in case (c). Analogy with prior experience of the same general type would probably be used to suggest reasons in this case.

(e) See (a) above.

(f) The remains would be observed and concomitant circumstances studied. The hypothesis would be formed, and the likely results compared with those actually obtained.

(g) Statistical enquiry would be essential. There would be deduction from established laws also.

(h) Simple enumeration would give place to analogy, and the latter to analysis. The Method of Difference would be used, and probably the Joint Method also, and an endeavour would be made to find some circumstance the variation of which corresponded with the noted variation of the effect.

884. W. & M., 297–301.
Give canons of: Method of Agreement, Method of Difference, Joint Method, and Method of Concomitant Variations.

885. W. & M., 301–3, 306–9.

886. W. & M., 236–8.
So thought Bacon, and he proposed his *methodus exclusiva*. But in reality method, however good, has to be ruled and directed by mind. A mechanical induction is impossible.

887. W. & M., 331.

The statement is correct. A hypothesis must afford a basis for deductive inference, but if both the proposed agency and the manner of its action are new, such a basis is not secured.

888. W. & M., Ch. XXV.

The immediate premises, however, will be appropriate statements about the subject-matter concerned, these statements being the result of observation and experiment. But in observation here must be included inference and interpretation.

889. Because selection, discrimination, and inference enter largely into all valuable observation. Thus one man may be better trained and equipped than another as well as more quick-witted and cautious.

890. W. & M., 297–301, 452–4.

Mathematicians may, of course, use both. But *actually* in pure mathematics neither is in the ordinary sense made use of.

891. The canons of inductive reasoning are the results of observation; but it cannot be said that their theoretical basis is the result of observation.

892. W. & M., 356–9, 352, 359, 360.

893. " The problem of the Deductive Method is to find the law of an effect from the laws of the different tendencies of which it is the joint result." According to Mill it contains three steps:—

1. The ascertainment of the laws of the separate causes by direct induction.

2. Ratiocination from the simple laws of the complex cases.

3. Verification by specific experience.

The Deductive Method will thus be used in complex cases and where Composition of Causes is operative.

(a) will be involved in all the steps, but especially in the second and third stages.

(*b*) will be present notably in the first stage.

894. W. & M., 301–3.

The negative experiment ceases to be available—

(*a*) when we have to do with constant conditions, *e.g.* in some enquiries concerning the operation of the law of gravitation;

(*b*) when from the nature of the case moral considerations prevent us from doing anything we like with the subject-matter we are investigating, *e.g.* in many economic, political, and social investigations.

895. W. & M., 337–44.

CHAPTER IX.

QUANTITATIVE METHODS.

951. W. & M., 414–19.

952. W. & M., 436–40.

953. W. & M., 364–70.
The Method of Concomitant Variations is meant.

954. The basis of the method was Jevons' thoroughly empirical view of the nature of induction.

The method was applied not by a series of experiments, but by the merely partial knowledge concerning uniformities that in many cases is all we are able to obtain: " The method which we employ in the theory consists in calculating the number of all the cases or events concerning which our knowledge is equal. If we have the slightest reason for suspecting that one event is more likely to occur than another, we should take this knowledge into account."

955. W. & M., 419–24.
This really amounts to the true statement that probability is a measure of rational expectation. To use the term " belief " in this relation is, however, misleading.

If a and b are independent events which occur in relation to any subject S, the chance that S is both a and b is the product of the probabilities of a and of b.

Strictly we have

$$\text{Prob. } ab = \text{Prob. } a \times \text{Prob. } b \text{ (if } a\text{)}.$$

956. W. & M., 452–8.

957. A standard is an arbitrary magnitude in terms of which all results of measurement are expressed.

A unit is the standard that may be applied over and over again to the same thing, so as actually to measure it.

The standard is used indirectly in measuring quantities

because it is a kind of fixed point of reference, "a typical specimen alongside which other things are brought and with which they are compared."

958. W. & M., 419-24.

The view of probability here referred to is usually called "objective," and is based on the idea of a series which presents individual irregularity but aggregate regularity. Then probability is said to be a measure of what actually will happen in continued experience. Examination, however, shows that this itself requires the "rational" view for its justification.

959. (a) W. & M., 425-32.

This gives the rule of multiplication:—

Prob. a and b = Prob. $a \times$ Prob. b (if a).

(b) Supposing the events also are exhaustive and equally likely, then at any rate one of these events *must* occur, *i.e.* the probability that some one will occur is 1. That is, we get the rule of addition:—

Prob. (a or b) = Prob. a + Prob. b.

(c) W. & M., 434-6. The rule may be expressed thus: If an event has occurred m times the probability that it will occur once more is $\dfrac{(m+1)}{(m+2)}$.

960. (a) Events "equally probable" are events any one of which is just as likely to recur as any other, but no more likely.

(b) Independent events are such that they are not necessarily connected and not necessarily incompatible.

See also (b) in 959 above.

961. W. & M., 419-24.

It is not founded upon statistical evidence, and it is not wholly a statement of ignorance. The statistics have to be interpreted, and so may come to aid us in estimating the measure of rational expectation, while on the other hand some knowledge must be assured, *e.g.* that possible alternatives are exhaustive, exclusive, and equally likely.

Let S = sovereign and s = shilling.

At any draw there are 5 possibilities. Thus we might have S_1, or S_2, or S_3, or s_1, or s_2.

∴ Chance of S at a given draw is $\frac{3}{5}$.

∴ Chance that the second draw will take place is $\frac{3}{5}$.

And again the chance of S is $\frac{3}{5}$.

∴ Chance of S and S is $\frac{3}{5} \times \frac{3}{5} = \frac{9}{25}$.

∴ Chance of 3rd draw is $\frac{9}{2}$.

And here the chance of s is $\frac{2}{5}$.

∴ Chance of S and S and $s = \frac{9}{25} \times \frac{2}{5} = \frac{18}{125}$.

962. W. & M., 450–2.

963. W., II., 428–30.

When there are five alternatives each equally likely, the probability of any one is $\frac{1}{5}$, and that of its being one or other of the rest is $\frac{4}{5}$. Therefore we say that the odds against the one are 4 to 1.

964. W. & M., Ch. XXXIII., pp. 450–2.

965. W. & M., 450–2.

The doctrine of chances is not founded upon statistical evidence, or "frequency probability," as it is often called, but upon inadequate knowledge concerning the essential conditions operative. Often, however, statistics are necessary to provide the data for calculation.

966. W. & M., 432–4.

Taking x as cause and y as effect, we have—

Prob. x and y = Prob. $x \times$ (Prob. y) *if* x.

And Prob. y and x = Prob. $y \times$ (Prob. x) *if* y.

But Prob. (x and y) = Prob. (y and x).

∴ Prob. $y \times$ (Prob. x) *if* y = Prob. $x \times$ (Prob. y) *if* x.

∴ (Prob. x) *if* $y = \dfrac{\text{Prob. } x \times \text{(Prob. } y) \text{ } if \text{ } x}{\text{Prob. } y}$

which is the inverse rule of Probability.

K. L. E.

Probability helps to eliminate casual coincidences in so far as it enables us to see whether the actual number of times coincidences occur in conjunction is greater than the probable number.

967.
$$\text{Chance of } DE = \frac{1}{5}.$$

$$\text{,, ,, } SS = \frac{1}{12}.$$

$$\therefore \text{Chance of } DESS = \frac{1}{5 \times 12} = \frac{1}{60}.$$

$$\text{and ,, ,, } DES'S' = \frac{12-1}{60} = \frac{11}{60},$$

$$\text{,, ,, ,, } D'E'SS = \frac{5-1}{60} = \frac{4}{60},$$

$$\text{,, ,, ,, } D'E'S'S' = \frac{(5-1)(12-1)}{60} = \frac{44}{60}.$$

Thus probably in any 2,000,

$33\frac{1}{3}$ are short-sighted and dark-eyed.

$366\frac{2}{3}$,, dark-eyed but not short-sighted.

$133\frac{1}{3}$,, short-sighted but not dark-eyed.

$1466\frac{2}{3}$,, neither short-sighted nor dark-eyed.

Whether Pearson's statement is accepted must depend upon what meaning is given to the terms " description " and " explanation." It is certain that science does not answer the most ultimate questions.

968. What is meant is that while in deduction we bring cases under the scope of accepted laws, in induction we try to show the methods by which the laws themselves are to be established. In deduction we have the general statement of the conditions and find the results, and in induction we have the results and find the conditions.

If we are sure that we have a thorough and adequate knowledge of relevant conditions, we may attain sufficient certainty for practical scientific purposes. But inductive certainty is not to be identified with theoretic finality.

CHAPTER X.

GOAL OF INDUCTION.

1001. W. & M., Ch. XXXIII.

1002. By "investigation of a Cause" is meant "search for a Cause." And this is inductive in so far as it involves careful analysis of the facts of experience with a view to bringing them within the scope of some general principle. Frequently of course some of the arguments involved will be deductive.

1003. W. & M., 443, 455-65.

Whether this view is to be allowed any force depends upon what range we give to Explanation. Processes of deduction will usually be involved, but will not cover the whole scope of the investigation.

1004. W. & M., 329-32, 348.

By "scientific theory" is meant "fully established Hypothesis."

(a) It is necessary that there should be agreement and continued agreement of the facts with the results deduced from hypotheses. Usually it is held also that we must be able to reason back from the facts to the hypothesis, and in so far as

(b) means simply this it is valid. But if it goes so far as to say that hypotheses must always remain uncertain until possible competitors are rejected it is wrong.

1005. W. & M., 368.

In general verification means the assurance that facts agree with results deduced from hypotheses. In both Mill and Jevons it forms the third stage in the process of investigation. With Mill it is a matter of making sure that the calculation involved in the second stage—ratiocination—is accurate and the whole sufficiently minute and complex. With Jevons it

is a matter of establishing the validity of the first stage, *i.e.* hypothesis.

A scientist confronted by apparent exceptions to his hypothesis would use all the means in his power to discover whether they were really exceptions or not. If they persisted in spite of all attempts to eliminate them or to explain them consistently with his hypothesis, he would either modify or else reject his supposition.

1006. (*a*) W. & M., 226–32.

(*b*) W. & M., 441–51.

1007. W. & M., 441–4, 452–8.

If a law is really ultimate any attempt to explain it must merely refer to itself.

1008. W. & M., 284–6.

In all ordinary cases of scientific proof deduction of consequences from given or supposed conditions is involved. This may often be expressed syllogistically, but the whole process of proof cannot be adequately represented in this way.

1009. W. & M., 441–4.

It is not correct to say that explanation is essentially deductive, though usually it does involve deduction. We are given certain results, and have to find the premises or conditions from which they follow. But in deduction it is the premises that are given.

1010. Whatever apparent contradiction there is in the statements is due to the ambiguity of the term " explanation." If explanation is admitted to be the bringing of given facts within the scope of the working of wider principles, there is no clash of statements. On the other hand it should be noted that scientific generalisations are not obtained by a mere summing up of particular cases, as might be suggested by the second statement. There is a real analysis of relevant conditions.

1011. W. & M., 444–52.

1012. See 1005 above.

Verification is also sometimes used of the whole process by

which a hypothesis is *tested*, and sometimes of the process by which a hypothesis is *established*.

1013. W. & M., 274-7.
The limits are those boundaries within which the causal law holds good, but there is much dispute as to where these are to be drawn.

1014. Description is the giving account of relations existing between facts, or of the qualities possessed by facts.
For Classification see W. & M., 75-86.
For Explanation see W. & M., 441-4.
For the relation between Classification and Explanation see W. & M., 442, 443.

1015. From the point of view of perfectly accurate theory such laws cannot be more than probable. For one thing we never get them except in relation to other laws which may hinder their operation. But the laws may be sufficiently well established for all ordinary scientific purposes.

1016. Properly there is no valid distinction here. Causation really has to do with laws, and expresses universal relationship. Thus we may say that science endeavours to establish universal relations between the phenomena with which it deals, and that such relationship is what is meant by causality.

1017. W. & M., 441-4.
Explanation cannot properly be identified either with induction or with deduction, for it includes processes of both. There is no distinction of kind between explanation of a law and of a fact; the only distinction is a matter of depth of analysis.

1018. W. & M., 301-3.
The great requisite is complete knowledge and control of conditions. This would mean that we should know thoroughly all the relevant circumstances, their inter-relation and the manner of their operation. The main difficulty is the great complexity and close inter-relation of conditions. It is very rarely that we can exercise that complete control that is required.

CHAPTER XI.

CLASSIFICATION OF FALLACIES.

1051. Perhaps the most successful classification of fallacies is that which is based on the logical principle violated.

A. Fallacies incident to Conception.
  1. Faulty, or imperfectly conceived, Definition.
    (a) Embracing incompatible attributes.
    (b) Aristotle's *Aequivocatio.*
    (c)   ,,   *Figura dictionis.*
    (d)   ,,   *A dicto secundum quid ad dictum simpliciter* and its converse.
    (e)   ,,   *Compositio* and *Divisio.*
  2. Faulty Division.
    (a) Change of *fundamentum divisionis.*
    (b) Non-exhaustive division.
    (c) Omission of steps in division.

B. Fallacies incident to Judgment.
  1. Judgment involving self-contradiction.
  2. Misinterpretation of categorical propositions.
    (a) Aristotle's *Amphibolia.*
    (b)   ,,   *Accentus.*
  3. Misinterpretation of hypothetical propositions.
  4. Misinterpretation of disjunctive propositions.

C. Fallacies incident to Immediate Inference.
  1. False Opposition, including Aristotle's *Plures interrogationes.*

2. Illicit Conversion.
   (a) Of an A or O proposition.
   (b) Aristotle's *Accidens.*
   (c)   „   *Consequens.*
3. Illicit Contraposition.
4. Illicit Inversion.

D. Fallacies incident to Deductive Inference.
   1. Abstract.
      (a) Undistributed Middle.
      (b) Illicit Process of the Major.
      (c) Illicit Process of the Minor.
   2. Concrete—Four Terms—including (a) the use of a proposition involving any of the fallacies under A. 1. (b), (c), (d), (e), and B., 2.

E. Fallacies incident to Inductive Inference.
   1. False Analogy, leading to wrong hypothesis.
   2. Imperfect Observation.
   3. Illicit Generalisation.

F. Fallacies incident to Method.
   1. Taking as axioms propositions which are not self-evident.
   2. Aristotle's *Petitio principii.*
   3.   „   *Ignoratio elenchi.*
   4.   „   *Non sequitur.*

1052. (a) Restatement:—

No person incapable of patient investigation is able to be a successful scientist.

[Darwin is a man who was able to be a successful scientist.]

∴ Darwin was not incapable of patient investigation, *i.e.* Darwin is a man who was a patient investigator.

Enthymeme of second order. E A E, Fig. II. Valid.

(*b*) Restatement:—

> All good people are happy.
> All happy people are prosperous.
> ∴ All prosperous people are good.

This is A A A, Fig. IV., and contains Illicit Minor, but if we take the conclusion as I. the form is valid.

(*c*) Restatement:—

> If the budget is socialistic it removes the stimulus of self-interest, and if it presses unduly upon certain classes it is unjust.
> But either it is socialistic or it presses unduly upon certain classes.
> ∴ Either it removes the stimulus of self-interest or else it is unjust—and in either case it is bad.

This is a Complex Constructive Dilemma, and is formally sound. But the alternatives are not exhaustive or mutually exclusive, the standard of judgment is varied, and it might be objected that the proposed results do *not* follow. Rebuttal would be easy.

1053. (*a*) W. & M., 266.

(*b*) W. & M., 459.

(*c*) W. & M., 267-9. This, strictly, is when in argument *per impossibile* we disprove a thesis that is not really relevant to the point at issue.

1054. (*a*) Restatement:—

> All male householders are voters.
> X is not a voter.
> ∴ X is not a householder.

There is invalidity because the qualification " male " in the major premise is omitted in the conclusion. This might be called *Quaternio Terminorum* (Four Terms).

(*b*) This is the fallacy of *A dicto secundum quid ad dictum simpliciter*. If all close there can be no transference of custom.

(*c*) The fallacy here is one of Accident, *i.e.* the assumption that an A proposition can be simply converted. Only if all

members of the Union are committee men does increase of membership of the committee mean increase of membership of the Union.

1055. Restatement:—

(a) [All people with an imperfect accent are foreigners.]
   He is a man with an imperfect accent.
 ∴ He is a foreigner.

A A A, Fig. I. Enthymeme of first order. Valid.

   (b) All cases of A are cases of B.
   All cases of B are cases of C.
  ∴ All cases of C are cases of A.

This is A A A, Fig. IV., and is a case of Illicit Minor.

(c) Taking "slothful" as equivalent to "non-diligent," and "live in poverty" as the contradictory of "acquire riches," and the second proposition as a universal, we have:

 All diligent people are people who will get rich.
∴ No non-diligent people are people who will get rich.

And this is a case of *Illicit Inversion*. (Inverse of $S\,a\,P$ is $S'\,o\,P$ not $S'\,e\,P$.)

1056. (a) Restatement:—

 All able men are men who pass their examinations.
 A is a man who passes his examinations.
∴ A is an able man.

A A A, Fig. II. Undistributed Middle.

(b) Restatement:—

 If governments promote prosperity, they are good.
 The government of Turkey does not promote prosperity.
∴ The government of Turkey is not good.

Fallacy of denying the Antecedent.

(c) Restatement:—

   No ambitious people ought to be trusted.
   Some politicians are ambitious.
 ∴ No politicians ought to be trusted.

E I E, Fig. I. Illicit minor.

(d) Restatement:—

> All ambitious men are hard workers.
> He is a hard worker.
> ∴ He is ambitious.

A A A, Fig. II.   Undistributed Middle.

(e) Restatement:—

> No unobservant people are good story-tellers.
> All philosophers are unobservant.
> ∴ No philosophers are good story-tellers.

E A E, Fig. I.   Valid.   But the minor has been obverted from the given to avoid two negative premises.

(f) Restatement:—

> If any man spares the rod he hates the child.
> This man does not hate the child.
> ∴ This man does not spare the rod.

Valid.   Mixed hypothetical syllogism, *Modus tollendo tollens.* It is assumed that "not hating" is equivalent to "loving."

(g) Restatement:—

> If the statement made by the accused is true, his conduct is free from blame.
> But the statement is not true.
> ∴ His conduct is not free from blame.

Fallacy of denying the antecedent.

(h) Restatement:—

> Some Academy pictures are not beautiful.
> All Academy pictures are works of art.
> ∴ Some works of art are not beautiful.

O A O, Fig. III.   Valid.

(i) Restatement:—

> All Celts are likely to be impulsive.
> He is a Celt.
> ∴ He is likely to be impulsive.

A A A, Fig. II.   Valid.

(j) Restatement:—

> All corridor trains are fast trains.
> All corridor trains are trains with first class carriages.
> ∴ All trains with first class carriages are fast trains.

A A A, Fig. III.   Illicit minor.

(*k*) [No man who persistently pursues his own advantage is trustworthy.]

This man is one who consistently pursues his own advantage.

∴ This man is not to be trusted.

E A E, Fig. I. Valid.

1057. W. & M., 256–62.

1058. W. & M., 262–76.

1059. Reference is here to the fallacies of non-observation and of mal-observation.

W. & M., 303–11.

1060. If the conclusion of a syllogism is materially false, at least one of the premises must also be materially false. Probably this will most often be the major premise, where the major gives a general principle and the minor a particular instance.

1061. (1) W. & M., 309–11.
(2) W. & M., 344–7.

1062. A fallacy is a violation of logical principle disguised under a show of validity.

A false belief is an act of mind which attributes to an object qualities or relations which it does not possess, or an existence which it has not.

(i) All ill-managed businesses are unprofitable.

No railways are ill-managed.

∴ All railways are profitable.

A E A, Fig. I. But invalid, for we have four terms, and if to get three terms we obvert the major, we have two negative premises.

(ii) *Petitio Principii.* The given " reason " demands proof.

(iii) *A dicto simpliciter ad dictum secundum quid.* To inculcate one's opinions may be unobjectionable, but to use the influence of a public position to propagate religious views is a *secundum quid* which the general statement did not contemplate.

(iv) We get:

     All rational beings are identical with nature.
     All men are rational.
     ∴ All men are to be treated as equal.

The conclusion does not follow. The major does not seem to mean anything, but in so far as it does it merely assumes the conclusion and gives *petitio principii.*

(v) *Compositio.* Because a, b, and c is each a good bargain it does not follow that we should try to secure $a + b + c + $ . . . all at once.

(vi) All persons found guilty are persons who may be innocent.

     John Jones has been found guilty.
     ∴ He may be innocent.

Petitio Principii. The being found guilty is not the ground for the likelihood of innocence.

Formally, however, the syllogism is valid, and is in mood A A A, Fig. I.

(vii) If he means wrong he will do wrong; and if he means right your interference will be impertinent.

     But either he means wrong or right.
     ∴ Either he will do wrong or you will be impertinent
     —*i.e.* your interference can never do any good.

This is a pseudo-dilemma which really assumes the point at issue. It may easily be rebutted. *Petitio principii.*

(viii) No Scotsman is one who can see the force of a joke.

     He is not one who can see the force of a joke.
     ∴ He is a Scotsman.

Fallacy of two negative premises.

(ix) All people who can't do wrong are exempt from moral judgment.

     The king is a person who can't do wrong (by the constitution).
     ∴ The king is exempt from moral judgment.

This is Ambiguous Middle. In the major the Middle Term refers to moral, in the minor to legal, irresponsibility.

(x) This is best classed as irrelevant conclusion. To prove that he usually misses what he aims at is not to prove that the safest place is in front of his gun.

(xi) *Divisio.*

1063. W. & M., 303–11. Experiment may (*a*) unduly narrow the conditions involved, (*b*) lead to artificial isolation, (*c*) depend upon abnormal conditions.

1064. W. & M., 60–3.

1065. The reference is to Whately's classification. *Logical* fallacies are such that the conclusion does not follow from the premises, and include:
Purely Logical, made in the mere form of the argument (*i.e.* breaches of the syllogistic rules).
Semi-Logical, including all cases of ambiguous middle except its non-distribution.
Material fallacies are such as are evident only from the matter, for here the conclusion does follow from the premises.
Compositio: see W. & M., 63, 64.
Accident: W. & M., 141, 142.
Irrelevant Conclusion: 262–7.
Illicit Distribution: W. & M., 223.

1066. (*a*) This is a sort of material obversion, but is illicit.
(*b*) Unsound analogy.
(*c*) There is no real argument here at all but merely a statement involving illicit generalisation, if this is put forward as carrying its own proof.

1067. (*a*) W. & M., 60–3.
(*b*) W. & M., 63–5.
(*c*) W. & M., 106, 107.

1068. (1) *Ignoratio elenchi.* Also there is a lurking assumption that the study of Logic will ensure that no fallacies are made.

(2) *Petitio principii,* contained in the question begging epithet " just."

(3) The false analogy on which this statement is based leads to a begging of the whole question. Hence we have *petitio principii.*

(4) The construction is faulty. If the strictures of the critic are not voluntarily controlled, neither, perhaps, is the judgment of resentment on the part of the person criticised. It is assumed of course that nothing but the voluntary should be resented.

1069. (*a*) We cannot pass from "Some stories told by heathen authors are true" to "All told . . . true." So that this is a case of False Opposition, or it might be called *a dicto simpliciter . . . quid.*

(*b*) *A dicto simpliciter ad dictum secundum quid.*

(*c*)   No men are brutes.
        All brutes are irrational.
        All irrational beings are free from responsibility.
∴ No men are free from responsibility.

This is an attempt at an Aristotelian Sorites, but it is invalid, for it has a first premise negative and that at once involves Illicit Major.

(*d*) Best classed as *a dicto simpliciter ad dictum secundum quid.* If the idle grasped learning, they would *ipso facto* cease to be idle.

1070. (*a*) Formally the argument might be stated as a Constructive Mixed Hypothetical syllogism *Modus ponendo ponens.* There are two illicit assumptions here however:

(1) Logic is meant to teach a man to reason (but Logic is a practical science, not an art).

(2) If a man can reason better than another man there is no need for him to seek to improve.

(*b*) *Ignoratio elenchi* of the variety called *argumentum ad verecundiam.*

(*c*) *Petitio principii:* It is assumed:

(1) That " heavy " can exist by itself.

(2) That differentiation is equivalent to complete separation.

(d) ≡ No young animals that do not jump are healthy.
   All young lambs are young animals that jump.
  ∴ All young lambs are healthy.

As this stands there is no middle term, and if to get what we require we invert the major premise we have " Some young animals that jump are healthy," and that gives us Undistributed Middle.

(e) Illicit Generalisation.

  (f) The underlying argument might be expressed thus:
   All things that may fail in their purpose are worse
    than useless.
   Vaccination is a thing that may fail in its purpose.
  ∴ Vaccination is worse than useless.

This is A A A, Fig. I., and is valid.

Materially, the argument may be said to involve Illicit Generalisation.

(g) This is invalid Inference by Added Determinants. All that we can say is that " most old men are old wearers of coats."

1071. (a) All bullies are cowards.
   Some bullies are not liars.
  ∴ Some liars are not cowards.

A O O, Fig. III. Illicit Major.

(b) Neither Alice nor the Hatter is right. Alice's mistake is due to the ambiguity of " mean." In " I say what I mean," " mean " probably signifies " what I intend," " what I have in mind." But in " I mean what I say " " mean " implies " assert with confidence."

But what the Hatter says is not a fair parallel. There is no such ambiguity in " eat " as there is in " mean." The analogy therefore is a false one. While to pass from " I eat some of the things I see " to " I see all of the things I eat " is Illicit Conversion.

(c) *Post hoc ergo propter hoc.*

(d) The assumption is that other criminals are *not* carrying into effect their political creed. That, however, calls for

proof, while even were it true the question would still remain *why* the carrying into effect of a certain political creed should not be punished: *Petitio principii.*

(*e*) = If the population grows wages tend to be lowered.
    In Ireland wages are low.
    ∴ In Ireland the population has grown.

(1) We have the fallacy of affirming the consequent.

(2) The minor simply states that wages in Ireland *are* low, not that they tend to become lower, so that the case does not properly apply (*i.e.* there are really four terms).

(*f*) = If the majority using public houses are prepared to close them legislation is unnecessary, and if they are not prepared, to force such a measure on them by outside pressure is both dangerous and unjust.
    But they are either prepared or not prepared to close them.
    ∴ The measure is either unnecessary or dangerous and unjust.

Complex Constructive Dilemma. Formally valid, but it might be argued that even were the majority prepared to close the public houses, the measure in question would be needed to carry their views into practice. It is also assumed that those who use public houses know what is best for themselves.

1072. (*a*) = All who find the climate of the neighbourhood of X congenial prefer a mild climate.
    This person finds the climate of the neighbourhood of X congenial.
    ∴ This person prefers a mild climate.

A A A, Fig. I. Valid.

(*b*) = Love of money is a thing that produces misery.
    Love of self is a thing that produces misery.
    ∴ Love of self is (akin to) love of money.

Formally this involves Undistributed Middle; there is also an ambiguous middle. The " misery " produced is different, and produced under different circumstances or conditions.

(c) Formally there is no need that this should be so, for a proposition that is false in itself may be used as a premise in the establishment of a conclusion that is true in itself. We may get a true conclusion from false premises.

(d) = Any coast line exposed to the full force of winds from the Atlantic will undergo great changes.

(That coast line is exposed to the full force of winds from the Atlantic.)

∴ That coast line will undergo great changes.

A A A, Fig. I. Enthymeme of second order. Valid.

(e) = All sympathetic people are people who possess observation and constructive imagination.

Mr. B is a person who possesses observation and constructive imagination.

∴ Mr. B is a sympathetic person.

A A A, Fig. II. Undistributed Middle.

(f) = If a man has not practised immediate and mediate inference he will not do well.

But he has practised immediate and mediate inference.

∴ He will do well.

Fallacy of denying the antecedent.

1073. (a) = All mortals are liable to err (obverse of given).

All men are mortals.

∴ All men are liable to err.

A A A, Fig. I. Valid.

(b) If it had gone well with the travellers they would have arrived.

They have arrived.

∴ All has gone well with them.

Fallacy of affirming the consequent.

(c) = If the summer is dry agriculturists lose through the withering of the crops, and if the summer is wet, they lose because crops do not ripen.

But the summer must be either dry or wet.

∴ In any case agriculturists lose.

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Simple constructive dilemma. But the minor does not exhaust every alternative. The summer need not be either very wet or very dry, but of a mixed character. Moreover the argument rather assumes that all crops are of the same kind.

1074. (a) = All Liberals are Free Traders.
    Mr. X is a Free Trader.
  ∴ Mr. X is a Liberal.

A A A, Fig. II. Undistributed Middle.

(b) = Some sciences have a practical value.
   [All sciences have a theoretical interest.]
 ∴ Some things with a theoretical interest have also a practical value.

I A I, Fig. III. Enthymeme of second order. Valid.

(c) = Tariff Reformers, if their policy becomes law, will be pleased (for they will have won their desires), and if it does not become law, they will be pleased because they will continue to buy things more cheaply than under Tariff Reform.
  But either it will or it will not become law.
 ∴ In any case they will be pleased.

A Simple Constructive Dilemma. But it is faulty. The standard of judgment is invalidly shifted, and the reason given for the second alternative is entirely arbitrary. A Tariff Reformer might dispute the fact, as well as the state of mind attributed to him.

1075. (a) The phrase " but then only " indicates that A is the only possible antecedent of B, so that the affirmation of B warrants the affirmation of A. The argument may therefore be thus stated:—

     If B, then A
      B
     ∴ A.

Modus ponendo ponens of Constructive Mixed Hypothetical Syllogism.

(b) = Some cowards are weak.

All liars are cowards (or All cowards are liars).

∴ All liars are weak.

We have either I A A, Fig. I., involving the fallacy of Undistributed Middle, or I A A, Fig. III., involving Illicit Minor.

(c) B is older than C.

A is older than B.

∴ A is older than C.

This is a relative categorical argument of the type *a fortiori* based upon our knowledge of the relations of ages.

(d) = All tolerant men are men of wide experience.

Smith is not a tolerant man.

∴ Smith is not a man of wide experience.

A E E, Fig. I. Illicit Major.

An alternative form is:

No men who have not had wide experience are tolerant.
Smith is not tolerant——

But here we have two negative premises.

Again, we could say:

All men who have not had wide experience are intolerant.
Smith is intolerant——

But this gives us Undistributed Middle.

(e) *A dicto simpliciter ad dictum secundum quid.*

(f) = [All useful things teach matters of business.]

Logic does not teach matters of business.

∴ Logic is not useful.

A E E, Fig. II. Enthymeme of first order. Formally valid, but the major is pure assumption and involves *petitio principii.*

1076. (a) = All metals are conductors of electricity.

The atmosphere is not a metal.

∴ The atmosphere is not a conductor of electricity.

A E E, Fig. I. Illicit Major.

(*b*) = All great teachers | are | born and not made.

> [Some great scholars | are not | born and not made.]

∴ Some great scholars | are not | great teachers.

A O O, Fig. II. Valid. Enthymeme of second order.

(*c*) = A good conscience is not wealth.

> [A good conscience affords satisfaction.]

∴ Something that affords satisfaction is not wealth.

E A O, Fig. III. Enthymeme of second order. Valid.

1077. (*a*) Everything north of a position which is north of another position is also north of that other position.

> Sheffield is north of a position (Nottingham) which is north of another position (Rugby).

∴ Sheffield is north of that other position (Rugby).

This is a relative argument based upon our knowledge of spatial relation, and it is disputed whether it should be allowed as a part of syllogistic doctrine.

(*b*) We might express by:

> All acts well adjusted to ends are called good on that account.

> Some conduct is acts well adjusted to ends.

∴ Some conduct is good on that account.

This is A I I, Fig. I. But the form is clumsy, and both major and minor might be seriously called in question. In fact we have here no syllogistic argument, but simply an inference by added determinants.

Thus: Conduct is acts adjusted to ends.

∴ Good conduct is acts well adjusted to ends.

But again it could be urged that it is not the adjustment but the end that is the basis of moral judgment.

(*c*) We might put this as follows:

> If a man cannot produce a certain effect, his power is limited.

> If a man does not know the cause in a given case he cannot produce a certain effect.

∴ If a man does not know the cause in a given case his power is limited.

This is A A A, Fig. I.

But to extend this to " knowledge and power are co-extensive " is to fall into the fallacy of *A dicto secundum quid ad dictum simpliciter*.

(*d*) = [Always where candles are put out there is husbandry.]
       In heaven candles are put out.
   ∴ In heaven there is husbandry.

A A A, Fig. I. Enthymeme of first order. Formally valid, but the whole is metaphorical only.

1078. (*a*) This is a case of *argumentum a fortiori*. But it could fairly be charged with both *petitio principii* and *non sequitur; petitio principii*, because it accepts the unwarrantable assumption that " we shall judge angels," and *non sequitur*, because there is no particular reason why judging angels should carry with it the judging of men.

(*b*) The position seems to be:
     If numbers of poor people do not drink, then often poverty is not caused by the use of stimulants.
     And numbers of poor people do not drink.
   ∴ Poverty is often not caused by the use of stimulants.

A valid constructive mixed hypothetical syllogism, *modus tollendo tollens*.

But the terms used are insufficiently defined. People who do not drink may be poor owing to the intemperate habits of others. The argument may be charged with *non-observation*, and there is also a tendency to appeal to the passions.

(*c*) This involves *petitio principii*. It is assumed that we injure the man, and that injury in this case means lowering of value to the community.

Formally we have:
       All punishment is injury.
       All injury is a lowering of social value.
       All lowering of social value is vicious.
       All that is vicious should be abolished.
   ∴ All punishment should be abolished.

An Aristotelian Sorites.

(*d*) The fallacies are:

(1) Composition. Three instances of love do not cover " all " love.

(2) Aequivocatio. To love things related to oneself is not directly love *of* self.

The Logical form is:

Love of what belongs to *you* is self love.
Love of children, friends, and country is love of what belongs to *you*.
∴ Love of children, friends, and country is self love.
All love is (like) love of children, friends, and country.
∴ All love is self love.

1079. (i) False Analogy.

(ii) Illicit Generalisation, or Unsound Analogy.

(iii) There is a possible ambiguity owing to the construction of the opening sentence. " Under forty " may refer to the number of people in the room. In that case the fallacy is *Amphibolia.* Or there might be *Divisio* due to confusion between collective and distributive uses of " all."

1080. (*a*) = All money is useful.
All money is wealth.
∴ Some wealth is useful.

(" Wealth is useful " is particular, as its predicate is a separable accident.)

A A I, Fig. III. Valid formally. Questions might arise concerning the meaning of " wealth."

(*b*) = All ships making for that port are ships that will be quarantined.
This ship is not a ship making for that port.
∴ This ship is not a ship that will be quarantined.

A E E, Fig. I. Illicit Major.

(*c*) We are given:

All the electors present are favourable.
Some electors are not present.

But in this there is no middle term, and consequently there can be no conclusion. While if we write:

> All present electors are favourable,
> Some electors are not present electors,
> ∴ Some electors are not favourable,

we have Illicit Major.

1081. (*a*) The implication is that they did so speak of him, and hence that he is the author. This formally is a Constructive Mixed Hypothetical syllogism of the type *modus ponendo ponens*. But the major premise involves *petitio principii*.

(*b*) = [All clocks that have just been set right by Greenwich time are correct.]
> This clock has just been set right by Greenwich time.
> ∴ This clock is correct.

A A A, Fig. I. Valid. Enthymeme of first order.

(*c*) = [No studies that are concerned with what ought to be, and not with what is, are correctly described as sciences.]
> Logic and Ethics are concerned with what ought to be and not with what is.
> ∴ Logic and Ethics are not correctly described as sciences.

E A E, Fig. I. Formally valid. Enthymeme of first order. But the major premise here may fairly be charged with assuming the conclusion.

CHAPTER XII.

MISCELLANEOUS QUESTIONS AND PASSAGES FOR ANALYSIS.

1101. (a) A law of nature is a descriptive uniformity expressing a relation existing between phenomena, such relation being regarded as thoroughly established.

(b) A derivative law is a uniformity of a narrower range which is regarded as following from a more widely established uniformity.

(c) An empirical law is a somewhat narrow generalisation which applies to all instances which have been observed within its somewhat narrow range. It has been called "a derivative law which has not been derived." A better term for it is empirical generalisation.

1102. (a) W. & M., 267.
     (b) W. & M., 262–7.
     (c) W. & M., 60–3.

1103. (a) W. & M., 338–44.
     (b) W. & M., 271–3, 337, 338.
     (c) W. & M., 448–52, 456.

1104. (a) W. & M., 44, 45.
     (b) W. & M., 66.
     (c) W. & M., 337, 338.

1105. (a) W. & M., 141, 142.
     (b) W. & M., 79.
     (c) W. & M., 334, 335.

1106. (a) (See No. 68.) "Explicative" is a synonym of "verbal."
     (b) W. & M., 168.
     (c) W. & M., 78–80.

1107. (a) *Enumeration:*

A, B, C, . . . M, all of whom have studied Latin, are cultured persons.

(b) *Analogy:*

The study of Greek, French, Italian, etc., is valuable in education. Latin is in some respects like these.

(c) So far we have suggestion only. We now push our analysis farther, and use, if possible, the following methods:--

(i) *Method of Agreement:*

We take a number of cases varying in as many other factors as possible, but all instances of persons who have studied Latin. In all cases we attempt to prove the presence of culture.

(ii) *Method of Difference:*

We take cases in which Latin *has* been studied, and the student is cultured; Latin has not been studied, and the culture is lacking; Latin has been inadequately studied, and there is little sign of culture.

(d) We then analyse more carefully. We endeavour to show what factors are of importance in a good education, and then that such factors are stimulated by the study of Latin. Here a good deal of deductive work will come in. Thus we shall get " All studies that promote the qualities x, y, z are valuable in education; Latin promotes these qualities: therefore Latin is of value." If we find that actual results are as they should be according to this argument we may fairly take the hypothesis to be established.

1108. The following is a possible outline:—

The basis of representative government—study of results of gradual extension of franchise.

Women in other realms—her place in the modern economic world—use of analogy to suggest what help she might bring in politics.

Analysis of some of the main questions confronting contemporary statesmanship, and the suitability of women to deal with these.

Study of results attained in countries where women suffrage has been adopted.

Finally, if an attempt is made to deal with " woman's function," this must not be made to rest upon authority, but must be the result of a careful analysis of fact.

Argumentative discussion would be likely to differ from this in that each of the principals concerned would be mainly concerned to defend or to establish a thesis. Each would start from a presupposition and argue in the main deductively.

1109. (*a*) The argument proposes as *hypothesis*: that the exquisite development of modern home life is made possible only as an accompaniment and result of modern social life.

There are two main contentions in the argument:

1. *Negative:* Family feeling without social intercourse gives lamentable results—witness China.

2. *Positive:* Nations most highly social form the best family circles.

The method is by *observation*, there is little analysis, and the instances are not sufficiently diversified.

Criticism:

(1) The one negative instance is not enough, and is very inadequately analysed. Family worship may be a poor witness of what is meant by home life.

(2) The positive instances are merely stated to exist, not definitely referred to; and again the analysis is strikingly inadequate.

(3) It is a serious fault that " home life " is nowhere defined. In one place we have " such homes as we desire to-day." That tends to beg the question.

1110. The " argument " is that classical study has greater disciplinary value than the study of English.

The counter-argument is that the study of a foreign language is *less* important in education than that of one's own tongue.

The points in the argument are not clear from the given extract. Apparently the sole emphasis is laid upon discipline, which is a vague term and may mean all sorts of things.

The counter-argument is mostly beside the point. We get:

(1) Teaching of Latin is a survival from the times when Latin was actually spoken—but that has nothing at all to do with its present disciplinary value.

(2) Study of languages may show children that words are the servants of ideas. This is apparently based upon observation and enumeration: it is a new point and is outside the course of argument proper.

(3) Foreign languages must to a large number of children always remain inaccessible. This is an illicit generalisation of the type " What has not been never will be," and in any case is totally irrelevant to the point at issue.

(4) Foreign language study can no more replace the study of the mother tongue than a finger can replace a hand. This simile adds nothing to the argument.

1111. (a) W. & M., 348.

(b) A fruitful hypothesis is one from which conclusions which can be definitely established, or rejected, or modified, can be drawn. A barren hypothesis is one from which no verifiable conclusions can be drawn.

(c) W. & M., 276, 277, 322–35, 444, 446–8.

1112. *Subject of enquiry:* The sense of smell in worms.
Method of research: Varied experiments, but the factors are not altogether clearly separated.

(a) Gentle breathing: no result.

(b) Breathing while chewing tobacco: no result.

(c) Breathing with pellet of cotton-wool and millefleurs perfume in mouth: no result.
Symbolically:

If p represents the condition of the worms, $b c d$ the general constant conditions, and a the variable element, we have:

$$a b c d \sim p; \quad a' b c d \sim p; \quad a'' b c d \sim p.$$

The suggestion, by the *Method of Agreement*, is that " a " has no relation to p. But a is here, Darwin thinks, not sufficiently clearly defined: a second series of experiments is

therefore undertaken. Again there is no result except in the one case of the acetic acid, and here there is probably a change in a concomitant circumstance, *i.e.* irritation of skin, so that we get an apparent exception only.

The *generalisation* then is, " Worms smell certain odours only, and these but feebly," the whole being based on the proved timidity of worms. This generalisation is stated as a derivative law from the wider law according to which reaction is always in the service of some want or other.

1113. W. & M., 34.

When two or more bases of division are adopted and used at the same time, the resulting overlapping is known as cross division.

W. & M., 50, 51, 213, 214, 45, 266.

1114. (*a*) = All statesmen who harp upon their consistency lay themselves open to the charge of little-mindedness.

This statesman harps upon his own consistency.
∴ This statesman lays himself open to the charge of little-mindedness.

The implication, which however is not proved, is " this statesman *is* little-minded."

" Consistency " is an ambiguous term (as it is used in a wider and a narrower sense), and seeing that it is not defined in any way, the argument may be fairly charged with *Aequivocatio*.

(*b*) The argument is: A by himself would not have been moved to sedition; B by himself would not have been moved to sedition; C by himself, etc.; therefore A + B + C . . . would not have been so moved. Fallacy of *Compositio*.

(*c*) There is no attempt at proof; but it is suggested that mental development is not due to natural selection. The extract is a retort and consists in pointing out what is said to be an *unsound analogy*.

It is admitted that:

(1) Physical development is continuous.

(2) Physical development is explained by natural selection.

(3) Mental development proceeds *pari passu* with physical.

Then it is said " But this resemblance is not enough to prove identity of cause." Apparently it is held that natural selection may have something to do with the matter. No positive reason is advanced for its being inadequate.

1115. The thesis is:

Wealth is increased (1) by large scale production, (2) by introduction of machinery, and (3) by division of labour.

The method of proof is by comparison of cases said to be similar in nature, with the enumeration of instances, and some analysis to conclude.

Thus we get a number of instances.

(*a*) Railway compared with stage-coach.

(*b*) Coach compared with pack-horse.

(*c*) Cotton mill compared with spinning-wheel.

(*d*) Spinning wheel compared with distaff and spindle.

(*e*) A sweeping statement covering " every form, stage, and period," and indeed hardly justified by what has been said.

In all cases the three factors mentioned above have progressed with increase of wealth. We get:

$$a\,b\,c\,d \sim p; \quad a\,b\,c\,d' \sim p'; \quad a\,b\,c\,d'' \sim p'',$$

where d is the variable complex noted.

Finally the writer seeks to establish a reciprocal proposition. d being practically absent, so is b; d being present in marked form, so is b.

There is some attempt, not clearly defined, to use the method of *Concomitant Variation.*

The conclusion is not completely established. The analysis is insufficient, so that possibly p might stand in the relation of cause to d. Moreover all sorts of relevant accompanying circumstances are not noted.

1116. W. & M., 40. An exponible proposition is a compound proposition, the composition of which is not obvious. See No. 68, and W. & M., 221, 209, 262-7.

1117. (i) W. & M., 452-5.

(ii) W. & M., 272.

(iii) Composition of causes is the principle involved where a number of separable conditions unite to produce a single result; or, in Mill's words, where "two [or more] different agents, operating jointly, are followed, under a certain set of collateral conditions, by a given effect."

When the joint effect is the sum of the separate effects, so that each agent produces exactly so much result as it would if it were acting alone, the composition is " mechanical."

When " the agencies which are brought together cease entirely, and a totally different set of phenomena arise " the composition is " chemical."

(iv) W. & M., 448-52.

1118. (a) W. & M., 303, 304, 355, 357.

(b) W. & M., 168.

(c) W. & M., 44, 45.

1119. (a) W. & M., 95.

(b) W. & M., 41.

(c) W. & M., 272.

1120. We get two main arguments:

(1) A Goclenian Sorites:

No people who suffer the consequences of wrong-doing are happy.

All people who do wrong suffer the consequences of wrong-doing.

All people who have much to do are people who do wrong.

All people in high stations are people who have much to do.

∴ No people in high stations are happy.

(2) An Aristotelian Sorites:

All people in high stations are judged by many.

All judged by many are censured and obstructed by the bad and sometimes misunderstood by the good.

All censured and obstructed by the bad and sometimes misunderstood by the good are unhappy.

∴ All people in high stations are unhappy.

Restatement:

He who has little to do will have to omit much of good that might be done, and for his omission must suffer the consequences; and if it were possible that he should gratify all his wishes, few will ever judge of his conduct, so that the bad will not spur him on by their malevolent censure and opposition, and the good will not encourage him by their approval. Men in humble positions cannot therefore expect to attain happiness.

1121. W. & M., 283–7.

It would be more correct to say that the common reference to fire as cause in this case is due to the fact that the other relevant conditions are taken for granted. Conceivably in other cases " the ordinary man " might refer to atmospheric pressure as cause, and then the heating by fire would in Sigwart's phrase be a mere " circumstance." Invariable presence of a given factor is not of itself sufficient to constitute its cause, and neither is the immediate antecedent of perceptible change necessarily alone called cause. In some respects Sigwart's distinction may be useful, but it is not logically sound and could not be pushed far.

1122. (a) See No. 68.

(b) *Abscissio infiniti* (cutting off of the infinite or negative part) is the name given to a series of syllogisms in **Fig. II.** in which we exclude all possible predicates but one.

(c) A compound effect is an effect which may be analysed into several factors in such a way that the whole effect is exactly equivalent to the sum of the constituent effects.

1123. The argument is in the main deductive, and the general working idea is:

We must secure the development of a man's life.

The arguments may be briefly expressed in order thus:

(1) If we respect men's moral worth we are not able to admit that they should spend themselves on narrow private interests.

But we do respect their moral worth (this is the assumption already noted).

∴ We must not admit . . . interests.

(2) All men who are worthy of the name are men who have wider interests than those of their own lives (proved).

No voteless men are men who have wider interests than those of their own lives (" the right to vote can alone open," etc.).

∴ No voteless men are men who are worthy of the name.

(3) All things that give the rank and file of democracy an interest in the wider affairs of life are things that should be granted.

The right to vote is something that will give . . . affairs of life.

∴ The right to vote should be granted.

(1) is a mixed hypothetical syllogism of *modus ponendo tollens* of *Modus Ponens*.

(2) is a categorical syllogism, in mood E A E, Fig. II.

(3) is a categorical syllogism, in mood A A A, Fig. I.

The argument, however, is mainly a repetition which rings the changes on the prime assumption that we ought to develop a man's moral worth. Moreover, it contains here and there saving clauses such as " who is fit for it," or " outside religion (and perhaps not even outside it)."

1124. The argument is:

Metaphysical systems have been powerful instruments of progress.

This is made to rest, so far as this extract suggests, mainly on enumeration: all ages of intellectual vigour have possessed

some characteristic system of metaphysics, and this system is the cause of the vigour.

The counter-argument mainly points out that the analysis involved is not adequate. The vigour and the systems accompany one another, but the systems are effects rather than causes.

For: (1) What is most deeply persistent is the "external problem" of life, and it is that which gives rise to the metaphysical systems.

(2) Systems arise in the attempt to bring beliefs into harmony with speculative reason. Belief, however, is there before speculative reason, and is often there after reason has done its work.

If a is some belief, $b\,c\,d$ accompanying circumstances, and p any general philosophic position, we have the two cases:

$$a\,b\,c\,d \sim p$$
$$a\,b\,c\,d' \sim p',$$

where a change in an accompanying circumstance, d, is accompanied by a change in the philosophic position, p, while a remains constant. The inference, by a not very thorough application of the method of difference, is that variation in d gives rise to variation in p when $a\,b\,c$ are constant.

The argument is certainly not conclusive:

(a) A problem is never *merely* a problem: if it forbade thought its being would involve its non-being in a self-contradictory manner.

(b) There is no point in separating beliefs from philosophy, as Balfour does.

(c) No reason whatever is given why the struggle to harmonise belief and speculation should not be an instrument of progress.

1125. In this case the analogy is a false one. To discuss the basic nature of constitutions is in no sense like adding another storey to a falling house; it is rather—so far as the simile holds good at all—like strengthening the foundations.

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The validity of the " argument from example " depends on the importance for the end in view of the resemblances and differences noted. In this case the resemblance is not essential for the purpose.

Mill contended that the major premise of a syllogism was gained by comparison of particulars. But the particulars have to be analysed so that the *reason* for their likeness becomes apparent. It is this careful analysis which induction undertakes.

1126. (i) This is an argument from examples, the first part of which turns on the meaning of comparative terms, and the second part of which rests upon an ambiguity in the word " opposite." There are other ambiguities also. Thus:

(*a*) *Becoming* greater or less involves *having been* less or greater.

(*b*) Similarly *being* weaker involves *being generated from* the stronger, or being swifter from the slower; or being worse from better, or being juster from the more unjust.

But *becoming* and *having been* in (*a*) are vitally different from *being* and *being generated from* in (*b*).

(*c*) The next assumption is that all these—greater, less; weaker, stronger; swifter, slower, etc.—are *opposites*, and an illicit generalisation is made that all that is comes to be from an opposite.

(*d*) The rest is mere subsumption. Death is the opposite of life, and so death is generated from life and life from death. But (1) the opposition here is of a different nature. In the other case it is a matter of different stages in the same process and connected with the same individual; here we get apparently a total difference of kind; (2) the analogy drawn from sleep and waking is particularly misleading, for these are ordinarily accepted as stages in the life of a single individual, and in their case " is generated from " means nothing more than " follows."

(ii) We have:

(*a*) All existence is either due to something more ultimate or is itself the ground of all consequences.

But God's existence is not due to something more ultimate.

∴ God's existence is itself the ground of all consequences.

(b) If any existence is the ground of all consequences, its reality is to be found in the idea of it.

But God's existence is itself the ground of all consequences.

∴ The reality of God's existence is to be found in the idea of it.

(a) is a Constructive Mixed Disjunctive Syllogism, and (b) a Constructive Mixed Hypothetical Syllogism of *modus ponendo ponens*.

But the argument is an obvious circle. That God is the ultimate ground is proved from our idea of Him, and that our idea of Him is all His reality is proved from His existence as ultimate ground. In fact, the whole is no more than an assertion of the idea of God as ultimate.

1127. The usual view is that the genus is wider in denotation but narrower in connotation than the species. This, however, may be objected to on the ground that it supposes abstraction to be a mere process of "leaving things out" instead of one of generalisation by analysis. Driesch admits of course that the context is relatively vague and unspecified, and with that admission his contention may be accepted.

1128. The general position is that all the products of a primitive mind will be closely related within a given sphere. The argument is one from analogy: primitive weapons show strong resemblances one to another; hence primitive tales may be expected to do so. There is *some* justification for the contention, seeing that both weapons and myths are the results of the primitive man's attempt to deal with his surroundings. But the actual ground of the argument is not made sufficiently explicit; it has merely a suggestive value.

1129. The following are hints which, in a complete answer, would have to be thoroughly worked out.

K. L. E.

Crime often the result of ignorance, as shown by criminal records. To *know* good may not be the same thing as to *do* good, but good has a better chance when it is known. Punishment is always a sign that the rules of some order, physical, moral, social, have been broken. That the criminal should learn that he *has* broken these rules is not enough: he must know also (1) what the rules are, (2) that the rules are good, (3) that he need not break them, and that it is to his advantage not to break them. If punishment is merely retributive the tendency is always for it to become very severe; but in that case history shows that it to a large extent loses its function as an instrument of social progress.

Reply: It is assumed that action is in some way determined, for, if it is not, the whole case for punishment as educative goes. This assumption needs careful proof.

And if action is determined the educative theory destroys moral responsibility, for it treats the offender as a doctor treats his patient. A criminal has a right to be punished; the educative theorist would merely coddle him. True, rules have been broken, but the man who wittingly breaks a rule must be made to suffer.

Undue severity of punishment is a mere by-product of an early stage of civilisation and by no means necessarily connected with a retributive theory.

Case for punishment as educative breaks down with incorrigible offenders, who would go unpunished. Capital punishment would have to be abolished, and many other forms of punishment would be of no effect, and so punishment itself would tend to disappear. The queer result would obtain that the most striking crimes would be least severely punished since their evil would be most easily realised.

Analysis of Argument: In reference to recorded fact the argument is inductive: as when case for relation of crime and ignorance is based upon criminal records, and that for uselessness of severe penalties upon appeal to history. In both cases so far as this argument goes we hardly get beyond enumeration. For the rest the argument is mainly deductive, its main assumption being that to know the good is likely to lead to a performance of the good. It cannot be said that this is proved.

Analysis of Reply: That action may be undetermined is a relevant suggestion, but of no force since it remains a mere suggestion.

The second paragraph is deductive and based upon (1) a special meaning of responsibility, and (2) an assumption that an educative theory must be merely soft-hearted. Both (1) and (2) beg the question.

The third paragraph is mainly inductive and an appeal to history. The contention is that there is a concomitant variation of increase of civilisation and decrease of undue severity of punishment.

The fourth paragraph is deductive and consists in an application to special cases of the thesis to be disproved, and an attempt to show that in these cases the thesis leads to *reductio ad absurdum.* But even were this granted, it would still remain that to rest a general case upon these cases would commit the fallacy of *a dicto secundum quid ad dictum simpliciter.*

1130. (i) Boswell's argument is:

What induces a man to speak truth should be upheld.
Drinking wine induces a man to speak truth.
∴ Drinking wine should be upheld.

Johnson's reply is that this is of value only if it presupposes what needs proof—that men in general are liars. But the retort is beside the point, for

(1) It is not contended that wine-drinking *alone* induces truth-speaking.

(2) It is not so much a matter merely of saying the true thing, as of revealing some things that a sober person would conceal.

(3) Even on Johnson's reading of the proverb the argument might apply in many cases.

The objection then is an *Ignoratio Elenchi.*

(ii) The charge is:

"You love my mother solely for the sake of the money she has saved."

The reply is:

> If I love your mother solely for the sake of the money she has saved, I can't love her any more with that money than I should without it.
>
> But I do love her more with that money than without it.
>
> ∴ I do not love your mother solely for the sake of the money she has saved.

This is a mixed hypothetical syllogism in *modus ponendo tollens* of the *Modus Tollens*.

The reply, however, is guilty of *aequivocatio* in its endeavour to mingle love of money and love of a woman.

> (iii) A majority of Glasgow citizens are Scotchmen.
>
> He is a Glasgow citizen.
>
> ∴ He may be a Scotchman.

Formally there is undistributed middle (as logically "a majority of" = indefinite "some"). But the conclusion is not without foundation, and might be worked out with numerical precision if we knew what proportion of Glasgow citizens are Scotchmen.

> 1131. (i) We have:
>
> (*a*) What is unlimited is possible. ⎫
> (*b*) What possesses no negation is possible. ⎬
> (*c*) What allows of no contradiction is possible. ⎭
>
> (*a*)$_1$ God is unlimited. ⎫
> (*b*)$_1$ God possesses no negation. ⎬
> (*c*)$_1$ God allows of no contradiction. ⎭
> ∴ God is possible.

This is a three-fold argument in Barbara, but most people would admit that the premises are not well established, and we have undue assumption of axioms.

Then:

> If God is possible his existence is necessary.
>
> God is possible.
>
> ∴ His existence is necessary.

This is a mixed hypothetical syllogism in *Modus ponens, modus ponendo ponens.*

The major here, however, is pure assumption so far as this extract goes, and the whole lacks cogency.

(ii) The argument consists in the main of an illegitimate substitution of terms, and is full of ambiguity. It is accepted that:

(*a*) What is potential either may or may not be realised.

Then for " may or may not be realised " we get

(*b*) " may either be or not be," and so " the same thing is capable both of being and of not being." This of course means at the most that what is not yet realised *may* be realised *later* or may not be so realised. But the argument proceeds to substitute " may possibly not be " for " capable of not being," and then we get

(*c*) " what may possibly not be is perishable," where the idea is, not that a potentiality goes unrealised but that an actuality has ceased to be, which is a quite different matter. The point of view is then changed and we get

(*d*) Nothing imperishable is fully potential. The reason is that the fully potential may possibly not be. This of course has not at all been proved. At the most we can say that what is at present potential may possibly not be realised (though even this has only been asserted), but we cannot say that what is potential may possibly not be at all, for in that case it could not even be potential.

(*e*) Finally there is ambiguity in the phrase " exist actually," which is simply assumed without any proof whatever to mean " exist without change."

1132. The problem is: Does God change ?

It is assumed (1) that all change is either immanent or transient; *i.e.* either internally initiated or externally initiated.

We take first the alternative that in God's case change is transient, or externally initiated.

It is assumed:

(2) In proportion as anything is really good it is least affected by externally initiated change.
   God is best of all.
∴ God is least of all affected by externally initiated change.

Even supposing however that assumption (2) is accepted it is not shown that God is not affected at all by external influence.

We now have:

All change is internally initiated or externally initiated.
God's change (if it is possible) is not externally initiated.
∴ God's change (if it is at all possible) is self-initiated.

Assumption (3) is All change is change either for the better or for the worse, and so we have:

If God changes it is either for the better or for the worse·
God does not change for the better.
∴ If God changes He changes for the worse.

The minor premise is here taken as self-evident, since it is accepted (assumption 4) that God is already absolutely perfect.

We now have:

If God changes he changes voluntarily and for the worse.
But God does not change voluntarily and for the worse (for the statement that " No voluntary change is for the worse in God or man " is accepted and is assumption 5).
∴ God does not change.

1133. The argument is intended to disprove the theory that the purpose of the spark of fire-flies is to act as a warning to enemies. It is thus mainly negative, and proceeds by exclusion.

(1) A common fire-fly is diurnal in habits, and so are most insect-eating birds. Hence there is no spark visible, and hence of course no warning by means of a spark.

(2) Of those flying at night there is no warning for raptorial insects, for such insects feed freely on the fire-flies. In the first case we had spark absent and (presumably) alleged result present; here we have spark present and alleged result absent.

(3) This leaves only mistakes due to " a few crepuscular bats and goatsuckers " to be accounted for, and the display of luminous insects is altogether too brilliant to be accounted for by reference to this.

(4) Finally, by analogy, display of fire at night may "confuse and frighten" but does not "warn." This however has little force. Confusion and frightening would have the same result as warning.

In sum it cannot be said that the theory is disproved, though it is shown that the whole matter requires more careful research.

1134. (i) Restatement:

All prime numbers greater than 3 are numbers that differ from unity by a multiple of 6.

61 and 59 are numbers that differ by unity from a multiple of 6.

∴ 61 and 59 are prime numbers.

A A A, Fig. II. Fallacy of Undistributed Middle.

(ii) Restatement:

Some members were not clever.

All members were industrious.

∴ Some industrious people are not clever.

This is O A O, Fig. III., and valid. We cannot however get the conclusion: Some clever people are not industrious.

(iii) There is no argument here at all, but simply a psychological analysis of a man's desire for society. The statement "to enjoy without other people's knowing . . . is not much better than to be non-existent," is taken to be fundamental, and the rest is only an application of this to the special case under consideration. The proposed premises are all in want of proof, and of the same proof as the given conclusion. Hence we have *Petitio Principii*.

1135. (a) The purpose of the argument is to consider either:

(1) What proportion of the pupae of the tortoise-shell butterfly is likely to be preserved; or

(2) How far environment may be likely to affect preservation.

The method is by a kind of natural experiment, and is broadly quantitative. The general results are:

(1) It is established that a large proportion perishes.

(2) The striking difference between Oxford and St. Helens in this respect suggests need for further investigation. It may be: (a) that the pupae were more conspicuously placed at Oxford, or (b) that enemies present at Oxford were absent at St. Helens.

(3) The reference to the four surviving pupae at Oxford and the figures respecting St. Helens suggest that the nature of the background is an important factor in survival, and that nettles are favourable to preservation.

It cannot be said, however, that any conclusion is more than suggested.

(b) The method is essentially inductive.

A. The working hypothesis is: Geological changes are due to slow continuous alterations.

B. The bringing down of earth by a great river is taken as a test case.

Observation shows that so much earth is brought down by the Ganges during a given period.

C. The results of such continuous alteration carried on over very large periods are *deduced*, and are found sufficient to fit the facts marked by geological observation.

The suggestion is that the theory of continuous change must be accepted. So far as this extract goes the phrase " less reasonable " as applied to the rival catastrophic hypothesis is perhaps not justified. But this is one of the cases in which broad agreement with fact is all the verification that is available, for actual experiment is impossible.

1136. The thesis is:

Isolation itself is a cause of modification of species.

Let d stand for isolation, and p for modification. Then, says Wallace, if d is a true cause we must have cases

$$[a\,b\,c]\,d \sim p; \quad [a\,b\,c]\,d' \sim p'; \quad [a\,b\,c]\,d'' \sim p'' \ldots$$

where, with $a\,b\,c$, the accompanying circumstances, constant, and d varying, there is concomitant variation of p.

But this we do not get. Ireland is a test case. Here we have

$$[a\,b\,c]\,d \sim p; \quad [a\,b\,c]\,d' \sim p.$$

d', the increased isolation, has been achieved, but p, the state of the mammals, reptiles, and land molluscs, remains constant. Therefore d may be eliminated.

But, it is retorted, your own hypothesis of natural selection is in just as bad a plight. For there is constant change in that factor, but no corresponding change in the fauna.

This, however, Wallace tries to show to be but an apparent exception. That the working of natural selection is hindered is due to counteracting causes. But nothing can hinder the working of isolation in itself, and hence the argument as symbolised above must be accepted as sound.

The whole may be said to be an argument based upon a modification of Mill's method of agreement.

1137. The argument is that in times of great financial strain the banking reserve should be held back and hoarded.

The reasoning is: There is a great demand for money, so we must keep back what money we have as long as possible so that our resources shall not be drained. That is, there is a sort of concomitant variation between the demand and the care with which we guard our banking reserves.

The counter-argument is that financial strain is best met by a very ready use of the reserve.

The reasoning is largely based upon psychological analysis. Ready use of reserves will suggest that there is plenty of money somewhere and so, by creating a feeling of security, will serve to lull the panic.

If $a\,b\,c$ are relevant circumstances giving rise to d, the demand upon the reserve, and p is the reserve, then variation of $a\,b\,c$ and consequently of d will give rise to variation of p. If $a\,b\,c$ and d vary within certain assignable limits p will tend to be increased. Thus

$$[a\,b\,c] \sim d \sim p,$$
$$[a\,b\,c]' \sim d' \sim p_1,$$
$$[a\,bc]'' \sim d'' \sim p_2,$$
$$[a\,b\,c]''' \sim d''' \sim p_3.$$

But beyond certain limits the effect upon p is entirely different. We get, for instance,

$$[a\,b\,c]''''' \sim d''''' \sim p_1.$$

This will suggest that some factor which in the first cases was of small importance has, under these abnormal conditions, become of leading value. There is a kind of residual phenomenon concerned, and careful analysis finds this to be what is called public opinion. Thus the reduction of p_3 to p_1 will tend to bring back public opinion to the state in which it was when we had

$$[a\,b\,c]' \sim d' \sim p_1.$$

That is, d will once more become normal. The peculiarity of the case is the extraordinarily close interrelation of the factors involved.

1138. The general contention, which is admitted throughout the argument is:

If a play is not well supported it cannot be successfully produced (*i.e.* from the point of view of the stage-manager).

It is then held that

A good play is not well supported, and so a good play cannot be successfully produced.

The argument of the stage-manager is:

Always a week of intellectual plays is a failure.

[The Method of Agreement suggests that it is the intellectual nature of the play that lessens the support.]

Therefore, *a fortiori*, a year of intellectual plays will be a greater or a longer failure.

The reply is that the analysis here is too superficial.

It is taken for granted that " Serious plays will be attractive to serious people."

Then the general argument may be expressed formally as follows:—

All habits require much persistence before they are set.

Theatre-going is a habit.

Therefore theatre-going requires much persistence before it is set.

Putting these two contentions together we get "Serious plays will be much more likely to be supported if they are regularly produced."

The argument is inductive, being based on experience and in the main on enumeration. The counter-argument is partly inductive in that it demands a more thorough analysis of the cases referred to, and partly deductive in that when by analysis it has decided that theatre-going is a habit, it immediately brings this under a wider and presumably established generalisation concerning the formation of habits.

1139. (1) The given argument might be expressed thus: If education tends to diminish crime criminals should be illiterate, but "it has been found that . . . ," etc. The fallacy is best classed as one of non-observation, or it might be described *a dicto secundum quid ad dictum simpliciter.* The relevant facts of the proportion of criminals to the whole population, and the relative numbers of criminals now as compared with earlier times are forgotten. Again, a state of affairs obtaining in a special group is extended to cover a wide general proposition.

(2) The logical form of the argument is:

> All nations that make themselves strong make themselves respected and feared.
>
> All nations that increase their armaments make themselves strong.
>
> ∴ All nations that increase their armaments make themselves respected and feared.

But,

> All that makes a nation respected and feared should be adopted by a nation.
>
> Increase of armaments makes a nation respected and feared.

∴ Increase of armaments should be adopted by a nation.

The fallacies are:

(a) *Composition:* " All " in the major and minor premises of the first syllogism is used distributively, but in the conclusion collectively. The second syllogism simply concerns " a " nation, but the statement is supposed to apply to all.

(*b*) *Petitio Principii:* for it is simply assumed that increase of armaments makes a nation strong in the sense referred to.

(*c*) *Aequivocatio:* for so far as the argument is stated it makes a tacit and illegitimate transition from "what does happen" to "what ought to happen."

(3) There appear to be several arguments here. We have: (*a*) The retort of the writer against farmer and landlord. So far as this extract goes it is simply a charge against economists, landlords, and farmers of *non-observation*. It might be stated thus: "You have argued deductively from certain premises, but those premises are irrelevant, for they neglect the relevant conditions of possible emigration of labour." If the statement of the farmers' position is accepted the charge is a valid one. But the expressions "who usurped the name of political economists" and "reasonable demands" tend to beg the question. However, the logical moral of this is that conditions must be fully analysed.

Then (*b*) there is the argument of the farmer:

> If we keep wages low we shall have more money for ourselves.
> We shall keep wages low.
> ∴ We shall have more money for ourselves.

Formally this is valid, being *modus ponendo ponens* of the *Modus Ponens*. But the whole argument assumes the very point at issue, *i.e.* that employers can settle entirely what wages they give. And that, as the writer tries to show, is an illegitimate assumption.

Then (*c*) there is the argument of the landlords:

> If farmers have less money to pay in rents, rents will have to be lowered.
> If farmers have to pay more wages they will have less money to pay in rent.
> ∴ If they have more to pay in wages, rents must be lowered. (A A A, Fig. I.)
> But if rents must be lowered we shall have to suffer.
> And if farmers have to pay more wages rents must be lowered (proved).

∴ If farmers have to pay more wages we suffer. (A A A. Fig. I.)

Then the argument is: we are unwilling to suffer, so we must discourage the paying of more wages. But again the whole rests upon the pure assumption that wages may be determined wholly by employers.

Finally there is (*d*) the writer's full case, part of which is implied rather than stated:

> If wages are kept unduly low men will emigrate.
> If men emigrate the supply of labour will be greatly lessened.
> If the supply of labour is greatly lessened ultimately the wages paid must tend to rise considerably.
> ∴ If wages are kept unduly low ultimately they must tend to rise considerably.

This Aristotelian Sorites depends upon the " produce theory of wages," together with the recognised assumption that men tend to seek their own economic interests as far as possible.

1140. As far as details go a great deal would depend upon the purpose of the investigation. No problem of this nature would be taken up entirely from the beginning, that is, there would always be a certain range of circumstances within which the investigation would be confined.

Probably the most general problem would be the effect of the tax on the revenue, and the possible modification of other modes of taxation.

The main method then would be a careful comparison of the incidence of taxation before the imposition of income-tax and after the tax had been imposed long enough to yield definite results. For instance, it is often pointed out that Sir Robert Peel's re-imposition of the income-tax enabled him to abolish many duties on raw material; and in general it is argued that direct taxation leads to a reduction of indirect.

The general mode of investigation will be mainly by the Method of Difference. Factors will be separated as far as possible: so much is yielded by this group of taxes and so much by that. We have, say, taxes *a b c* producing revenue

m. The approximate increase that will be due to the new tax may be estimated with fair accuracy, and we may expect say $a\,b\,c\,d$ producing revenue m_4. But actually we get $a\,b\,c\,d \sim m_2$. The discrepancy suggests at once that the introduction of d means a modification of some of the factors $a\,b\,c$ already present. Further analysis may show this to be the case, as when the imposition of an income tax coincides with or is followed by the dropping or modification of some other forms of taxation.

HINTS ON ESSAYS.

The following very brief remarks may suggest lines of treatment of the essays set. They are in no sense meant to be exhaustive. The subjects are taken in the order in which they occur in the " Exercises," and each essay has its paragraph:

Give the principles—they are purely general, do not depend on material considerations, and are necessarily observed in all valid thought. Methods of investigation are the general ways in which we may try to establish causal relationship—they do depend on material considerations. The principles do not lead *immediately* to the methods, but the methods must not break them.

What it is—its relation to affirmation—is affirmation more fundamental?—is negation merely subjective?—why we use negation—how it expresses (1) exclusion and (2) exhaustion—the value and necessity of the negative judgment—how Logic deals with it.

The general problem of the modal judgment—what " possibility " may mean—what " degrees " mean—can we have degrees of possibility?—in general we speak ordinarily of degrees of *probability*, but it is better to refer to " kinds " rather than to " degrees " of possibility.

What description means—what explanation means—*kinds* of explanation—the goal of science—can explanation in science be reduced to description?

Illustrate the first by reference to the principles of thought, and the second by reference to any scientific generalisation

that is usually regarded as established. Suggest relations between the two and the greater complexity of conditions in the second case.

Take one or two typical logical doctrines, *e.g.* of Definition, Classification, or some inductive method—consider carefully the rules usually given in Logic, and then how these have to be modified in everyday life.

What is "form?"—what is matter?—the distinction always relative—the distinction applied in Logic—a definition of formal logic—inadequacy of such a system—how matter modifies form—how form is needed by matter—illustrate by reference to "formal" logical processes, and how they have to be modified by material considerations.

What is synthesis?—what is analysis?—what is inference? —how are all three related?

Comparative study never wholly free from definition—we must know something of what a judgment is before we can compare different forms—but always out of knowledge comes knowledge—what is a judgment?—different kinds of judgment: compare the forms in some order as definite as possible —the function of judgment in the search for truth.

Give the generally recognised principles. Interpret them and try to show how they may be applied and how they are related one to another.

What is description? What is explanation?—the nature and goal of science—relation of description and explanation to this goal. (The essay should be carefully illustrated.)

What is hypothesis?—different views on the subject—how observation is directed by purpose—how hypothesis helps to link fact and system—how hypothesis may lead to bias. (Illustrate throughout.)

Description and illustration of a negative instance—purpose of negative instance—how recognised by Mill—the negative instance a fresh illustration of the positive value of negation —in what way it may help to establish reciprocal relation.

What is extension? intension?—illustration of how general terms possess both—the difficulty with singular terms— Uniquely Descriptive Terms—Proper Names—Singular Abstracts—"experiential" terms, *e.g.* "this," "now," "I."

What existence may mean—the reference to Universe of Discourse—illustration of how this is necessary in formal logic—views as to the implication of existence in the logical proposition: adopt one or more and argue for your position —the wide question: is formal logic able to deal with the complexity and change of the actual world?

Distinction of hypothetical from categorical proposition— the hypothetical as the expression of law—formal relation of antecedent and consequent—the search for the reciprocal hypothetical—the hypothetical and the disjunctive proposition.

What is modality? The ordinarily recognised scheme of modal propositions—are all equally fundamental? Should Logic really deal with these differences?

The controversy about "necessary truth"—the three main views: mathematical reasoning (1) *a priori* analytic, (2) *a posteriori* synthetic, (3) *a priori* synthetic—explain each, compare all, and come to some decision as to the best.

What the principle is (see Jevons' *Principles of Science*, Intr.)—the view of pure identity on which it is based— algebraic logic, its formality, and its inadequacy.

The steps of Induction—different meanings of Verification —frequent wide use of term to cover whole process of testing hypotheses—inconvenience of this—illustration of verification proper according to the view you adopt.

The postulates of induction—relation of these to the principle of causation—range of reality over which this principle, in its inductive form, holds good—if over whole, induction has no limits—if over part only, then that part will constitute the boundaries of Induction.

Necessity for classification—attempts at classification: give two or three, adopt that which you think most satisfactory or invent another—impossibility of avoiding overlapping— use of such classification.

The nature and ultimate foundations of scientific truth— truth always general in nature, timeless, and unchanging— can it ever apply to existence adequately?—do the postulates of science apply to the whole world of actual reality?